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REVIEW

Volume 32 - Number 7 July 1952

Present Concepts in the Management of the Poliomyelitis Patient with Respiratory Difficulty — AUSTIN, DAIL, RUBIN, BOWER, and ACKLEY

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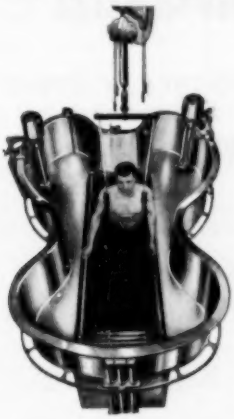

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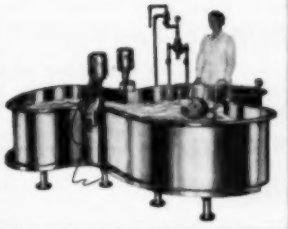

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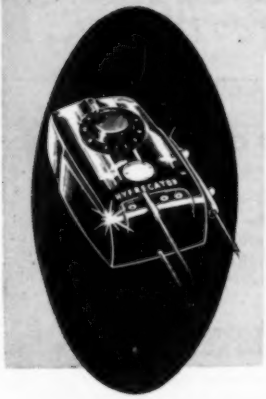

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Volume 32 **July 1952** **Number 7**

Present Concepts in the Management of the Poliomyelitis Patient with Respiratory Difficulty

Elizabeth Austin, M.D., Clarence W. Dail, M.D., David Rubin, M.D., Albert G. Bower, M.D., and Ruth Nygren Ackley

The evaluation of the patient with respiratory difficulty has long been one of the most difficult problems in the treatment of poliomyelitis, and failure to recognize the imminence of respiratory failure and other pulmonary complications may result in a high mortality rate. If the patient can be carried over the often fatal respiratory crisis, he may recover sufficient respiratory function to carry on a useful life.

It is a common misconception that respiratory failure in poliomyelitis is a sudden phenomenon, occurring in a matter of moments. This is because ordinary clinical observations may fail to reveal diminishing respiratory function.

Too frequently the use of the respirator is delayed until the patient is in extremis. This in part may be caused by unfamiliarity with, or fear of, the respirator, but probably a greater factor is the lack of definite criteria for its use.

The danger of routine use of the respirator to prevent fatigue and resulting asphyxia so long discussed in vague terms, is more fancied than real, while the permanent damage which may result from anoxia in the central nervous system in the presence of a neurotropic virus is extensive.

It has long been assumed that the patient who finally is put into the respirator is bulbar in type. Statistical studies however, show that while many patients do have bulbar involvement it rarely occurs alone; many more patients are combined bulbospinal in type or spinal alone with extensive involvement of the muscles of respiration.

"Respiration" refers to gaseous exchange between the organism and its environment. The more obvious features of this process are the absorption of oxygen and the elimination of carbon dioxide. With over simplification of the complicated vital processes involved, for our purposes it may be stated that oxygen is absorbed from the alveolar air, and delivered to tissue cells where carbon is oxidized to carbon dioxide and hydrogen to water. The carbon dioxide is then transported to the lungs for elimination in the expired air (Best and

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Taylor). We are chiefly concerned in this presentation with *external respiration* or the exchange of oxygen and carbon dioxide between the blood in the alveolar vessels and the air in the alveoli.

The flow of the air into (inspiration) and from (exhalation) the lungs is accomplished by rhythmical changes in the thoracic capacity, the lungs passively following these changes.

Development of anoxia or oxygen lack in respiratory failure is commonly emphasized *without sufficient consideration of the necessity for the elimination of carbon dioxide*. Thus the anoxia caused by inadequate ventilation is accompanied by carbon dioxide excess (hypercapnia) which may cause marked chemical changes in the acid-base balance of the blood resulting in pulmonary acidosis and death. The combination of oxygen lack and carbon dioxide excess is termed asphyxia. Consequently the usual habit of giving the patient with breathing difficulty oxygen by nasal catheter is solving only one part of the problem, for while he may be increasing his oxygen intake, he can only rid himself of the over supply of carbon dioxide by increased ventilation. In the normal patient excess carbon dioxide will increase the rate of breathing so that it is blown off. When weakness of the respiratory muscles exists, the patient can not make this compensation.

The muscles of respiration are concerned with rhythmically increasing and decreasing the size of the thorax so that oxygen is inhaled and carbon dioxide is blown off during exhalation. Consequently, the mechanical change in lung volume is intimately connected with the gas exchange across the alveolar membrane.

Normal respiration is carried out by active chest expansion and controlled return to the resting position. The muscles of expiration are usually considered accessory muscles. One method of classifying the muscles is primary, or those that function alone when there is no unusual demand; and secondary, or those that assist or take over breathing when the primary muscles are inadequate.

The diaphragm is the chief primary muscle of respiration. In shape and position it resembles a piston moving between the two cavities of the thorax and the abdomen. When the diaphragm contracts it moves downward in the form of a truncated cone, pushing the abdominal viscera before it, and the latter act as a fulcrum preventing straightening out of the diaphragm during contraction. The abdominal wall distends during inspiration, until as a result of the resistance finally offered by the abdominal muscles, the downward movement of the viscera is arrested, and the sternocostal portion of the diaphragm continues to contract to elevate the diaphragmatic ribs, and the sternum is thrust forward and upward. Thus the spinal or crural portion of the diaphragm in its descent increases the vertical diameter of the thorax, and the sternocostal portion permits lateral expansion of the lungs. This arrangement, as pointed out by Galen many centuries ago and later by Duchenne, permits increase in the size of the thoracic cavity in width when increase in height is diminished by a variety of causes.

Duchenne felt that the internal and external intercostal muscles are both inspiratory in function, expiration being a controlled relaxation, and his clinical and experimental evidence is incomparable. Bronk and Ferguson feel that in the cat the internal intercostal muscles are expiratory in function. Gray states that the intercostals do not move the ribs but contract simultaneously to form strong elastic supports which prevent the intercostal spaces being pushed out or drawn in during respiration, and stabilize the thorax against the movement of the diaphragm, consequently permitting expansion of the thoracic cage.

The primary muscles of respiration are closely associated with the respiratory center where rate and depth are integrated. In addition to the unconscious control of breathing there is also voluntary control whereby respiration can be volitionally suppressed for a short period of time, or the patient can hyperventilate himself to the point of tetany.

The accessory inspiratory muscles may include the scalene muscles, the sternocleidomastoids (which cannot act to assist in inspiration unless the head is maintained in fixed extension), the clavicular portion of the trapezius, the pectorals and the subclavian muscles. At times the muscles attached to the hyoid bone, the tongue and muscles which fix the neck and jaw such as the masseters, the temporals and the pterygoids, as well as the platysma may assist breathing.

Normally expiration is a controlled relaxation of the inspiration muscles rather than active muscular contraction of the expiratory muscles. The latter are used, of course, for such acts as coughing and sneezing, and occasionally they may be used for ventilation, particularly in the presence of marked mechanical obstruction or following violent physical exercise.

During active expiration the abdominal muscles play the largest part and by simultaneous contraction compress and push the abdominal viscera from below upward, transmitting this action to the diaphragm. Accessory muscles include the serratus posterior inferior and the transversus sterni.

Breathing patterns: The foregoing discussion of the action of respiratory muscles will give us a fairly simple method of evaluating the clinical pictures which are presented by patients with breathing difficulty.

Normally, quiet breathing consists of active inspiration with passive, controlled expiration, and air is drawn in at a rather constant rate, but leaves the lungs at a slightly accelerated rate. During deep and rapid breathing, airflow rate is increased and the expiratory phase may be associated with some muscle contraction.

1) *Normal pattern* (quiet breathing): As the diaphragm descends, the abdomen and chest rise at the same time and there is some flaring of the lower ribs.

2) *Diaphragm paralysis in the presence of normal intercostals* results in expansion of the chest with retraction of the abdomen and in some instances this results in ascent of the flaccid diaphragm with consequent diminution of the size of the thorax. During expiration the chest drops and the abdomen rises. This is a type of what we term "paradoxical respiration."

3) *Intercostal paralysis in the presence of an intact diaphragm* will result in depression of the chest cage during inspiration with normal expansion of the abdomen, while during expiration the chest rises and the abdomen is depressed, resulting in paradoxical respiration of a type opposite to that noted above.

4) Abdominal muscle paralysis alone does not cause any respiratory difficulty (Duchenne). However, the expulsive force needed for coughing is greatly decreased, and because of this the patient may develop complications, particularly when the airway is impaired by mucus collections.

5) Combinations of muscle weakness are frequently seen and the amount of weakness contributed by the various muscles evaluated will result in a modified pattern.

6) Involvement of the respiratory center may be associated with irregular rate and rhythm sometimes of the Cheyne-Stokes variety. The patient, unless comatose, is usually apprehensive and ventilation may be inadequate. When the muscles which are innervated in the bulb are involved, there may be inhibition of breathing because of the danger of aspiration of fluid through the larynx and this, too, may cause an irregular and jerky type of breathing.

It must be pointed out, however, that irregularity of rate and rhythm can also be caused by mechanical obstruction of the airway such as accumulated secretions, laryngeal spasm and abductor paralysis of the vocal cords. When this patient is given a clear airway by means of tracheotomy his rate and rhythm immediately become much improved. The factor of mechanical obstruction has long been overlooked in the production of abnormalities of respiratory rate and rhythm and has resulted in the assumption that many patients had involvement of the respiratory center when this was not actually a contributing factor.

The muscle spasm syndrome of shortening, tenderness, and stretch pain may also interfere with adequate respiration, and must be evaluated in connection with possible muscle weakness.

1) *Intercostal spasm* results in a chest that is characteristically rigid with associated tenderness of the intercostal muscles which may inhibit full chest expansion. Respiration is diaphragmatic. Contrast this with the picture of intercostal weakness noted previously.

2) *Diaphragm spasm* usually results in abdominal distention, and the patient is in considerable distress. When he tries to expand the chest, there is usually neck accessory action and expiration may be difficult. If abdominals are present they are used during expiration. Breathing capacity may be inadequate.

3) *Abdominal muscle spasm* may cause difficulty as coughing is impaired; the abdomen is rigid and tender and consequently may inhibit motion of the diaphragm.

When the breathing difficulty is on the basis of spasm of the respiratory muscles, the breathing pattern is usually shallow and choppy, the rate may be irregular and breathing may be painful.

When the chief difficulty is weakness unassociated with muscle spasm, respiration is shallow but regular, various abnormal breathing patterns may appear, and there may be use of the accessory muscles if they are intact.

Clinically, the chief findings, when there is marked ventilation impairment, are wakefulness, restlessness, fatigue, exhaustion, marked anxiety and mental confusion. The patient tends to use accessory respiratory muscles of the neck, abdomen, and nose. However, in the presence of paralysis of the accessory muscles, the patient may appear to be breathing quietly in the presence of marked inadequacy of ventilation.

The patient is usually not talkative, but speaks in monosyllables. The cough may be weak, the voice may be nasal, swallowing difficulty may be present and there may be an accumulation of mucus in the nasopharynx.

The use of cyanosis as a criterion for giving breathing assistance is not dependable, and its presence indicates severe anoxia. Detection of cyanosis has been shown to depend on lighting

or the individual perception of color changes and pigmentation of the patient's skin. Furthermore, cyanosis depends on the presence of five grams of unreduced hemoglobin per 100 cc. of blood.

Thus the patient with anemia can be dangerously anoxic before cyanosis appears. For example, if only ten grams of hemoglobin are present, he will become cyanotic when five grams are reduced, or when an oxygen saturation of fifty per cent is reached, perhaps a fatal level. Before this level is approached, the patient will have been anoxic for many hours, with resulting damage to neural tissue.

Treating of spasm consists of intensive, prolonged, and repeated hot packs placed over the chest and abdomen. If these do not give adequate relief the patient may have to be placed in the respirator. In the presence of embarrassment due to muscle weakness or paralysis the respirator is definitely indicated.

Considerable help may be obtained by the use of ventilation studies, and during this stage the vital capacity determination may be of great significance. As a rule it is felt that when the patient's total capacity drops to less than twenty-five per cent of normal, he should be placed in the respirator. This does not hold true, however, when the weakness is chiefly diaphragmatic. In this case forty per cent deficiency may require the use of the respirator. One must be careful, however, to avoid dogmatic dependence on ventilation studies. Other signs such as air hunger, the use of the accessory muscles, increased pulse rate, etc. should be recognized.

PUTTING THE PATIENT IN THE RESPIRATOR

Before placing a patient in the respirator he should be prepared psychologically for this step by telling him that this is a means of giving him rest. One must be sure that the patient does not have mucus in the airway so that the mucus may be sucked in and pulmonary complications result. If there is need for tracheotomy it is more desirable to do it before placing the patient in the respirator.

Although every respirator that is standing by for use should be in good condition, immediately before placing the patient in a respirator, it should be quickly checked for leaks, for motor efficiency, for speed and for the various accessories that should be available.

At least four people are necessary to move an adult patient into the respirator. The neck piece of the respirator should be prepared according to the directions of the manufacturer. The patient should be clad in a minimum amount of clothing so that he can be handled easily. The respirator carriage is pulled out. It is helpful to have one person stand at the head of the respirator to watch the head and protect the nose and face as it passes through the collar. Special care should be taken to avoid pressure at the back of the neck, and the rubber collar should not be in direct contact with the skin. It may be necessary to place a reinforcement of padding behind the collar but it should not be large enough to compress the chest. The patient's shoulders are usually in contact with the head-end of the respirator but a layer of flannel or light material should be between the metal and the skin.

CARE OF THE PATIENT IN THE RESPIRATOR

The patient may be bathed, his linen changed, and his back cared for by developing a teamwork technic using individuals on both sides of the respirator. The respirator may be pulled out for this work for about two minutes in most cases which are well stabilized. Care should be taken to avoid air hunger. Some advocate that the period for nursing care should be preceded by a period of hyperventilation, to permit the patient to be out longer. This procedure is dangerous, since hyperventilation causes a washing out of carbon dioxide, but does not appreciably increase the oxygen concentration of the blood. Thus, because of the lowered carbon dioxide tension, the patient's tolerance or sensation of lack of air is decreased although his need of oxygen still is present—he develops apnea vera.

If the patient cannot be pulled out on the respirator carrier for even two minutes all of his nursing care may be accomplished through the portholes and no pressure is lost for even one breath. The use of the portholes should be depended upon during the acute stage for the various minor needs of the patient. It is necessary to watch the pressure gauge carefully as well as the patient's face to observe any signs of distress.

A mirror on the head-end of the respirator is desirable. This should be turned so that the patient may be observed while one is working at the foot of the respirator. The time that the patient is taken out of the respirator for care should receive careful consideration, since during this time the patient may become considerably exhausted if he has marked weakness. Especially during the acute stage the patient should never be taken out long enough to cause him to use accessory muscles, become apprehensive, or present other signs of exhaustion. It is unwise to underestimate the patient's complaints.

It should be emphasized that the patient should be shifted or turned partly from side to side to avoid undue pressure points and special attention should be given to the care of the skin.

Every effort should be made to prevent respiratory complications. One of the most common causes is the occlusion of bronchii by mucus, which may be quite largely prevented by adequate suctioning, humidification and aiding the patient to cough. Penicillin therapy or antibiotic therapy may be used to prevent any serious complications.

Abdominal discomfort and distention may result from improper elimination, and gastric dilation may result from dietary indiscretion or from swallowing air. It may be very sudden in onset and require immediate emergency treatment. Any distention may cause marked respiratory embarrassment.

There are certain special precautions that should be taken in the operation of the respirator. The maintenance of proper pressure is paramount, and should be frequently checked day and night, as a gradual and moderate drop in pressure may cause serious anoxia. During and following patient care one should always check the pressure gauges. Make it a practice always to tell the patient before anything is done to the respirator, especially if a porthole is opened.

Hot packs are used on respirator patients that are in the respirator and, when there is consideable impairment of breathing, they may have to be given through portholes. This makes it quite difficult to effectively treat the patient. One should be careful not to exhaust him during the acute and febrile stage and in some cases the packs have to be avoided entirely. Care should be taken to prevent maceration of the skin and to avoid chilling, therefore the part should always be properly dried after treatment (Burston and Austin). The restricted space of the respirator promotes certain characteristic contractures in the long term patients, consisting chiefly of adduction of the shoulders, flexion of the elbows, and pronation of the forearms, and these may cause marked impairment of function later on.

Passive joint range should be given early within, of course, the range of pain. The patient who cannot be pulled out of the respirator cannot be moved through the complete joint range, especially at the shoulders, hips, elbows, and knees. It may be necessary to prevent or stretch out contractures by means of splints and slings.

Contractures develop not only in the extremities, but in the chest and probably also in the diaphragm as well. The chest can be stretched to a limited extent by manual manipulation, that is, by grasping both sides of the chest with the hands and lifting up the rib cage from below. Arching the back with a roll under the dorsal spine will aid. A practical and effective method of stretching is possible by the use of a Scultetus' abdominal bandage when the patient is either in the respirator set at higher than usual pressure, or is getting intermittent positive pressure by mask.

WEANING A PATIENT FROM THE RESPIRATOR

When it has been decided to place a patient in the respirator during the acute stage it is not usually advisable to remove him from it for even short periods of time during the febrile period. Nursing, packing, and physical therapy, if done, should be done through the portholes or with the patient out on positive pressure breathing.

After the febrile stage is over, and if the patient does not have debilitating complications such as atelectasis, pneumonia, and kidney infection, it is advisable to open the respirator for about one-half minute so that his breathing may be watched. The observations thus made, together with vital capacity studies, will determine the course to be followed. Before this test is made the patient should be told that it can not possibly hurt him, that he will be placed back after one-half minute, and that he will experience no appreciable lack of air. During the test period his attention should be diverted away from his breathing.

If during the test period there is diaphragm and chest movement the test can be repeated for a longer interval. If there is no movement of those muscles the test may be repeated with the patient trying to move the diaphragm and then the chest. If no movement still results, the test may be repeated every day or so. If movement is present, the test period may be extended for several minutes until the patient shows signs of fatigue such as subjective tiredness, increased pulse rate, or use of the neck accessory muscles.

Exercise periods as often as every hour may be instituted by having the respirator opened for periods that are about one-half as long as will cause signs of fatigue. During these periods the patient is instructed to breathe as taught by the physician and physical therapist. Those periods may be only one-half minute long. It is important that the patient has diaphragm and perhaps also chest movement even though slight, and that he uses only these muscles. Chest action alone without diaphragm motion contraindicates breathing exercises out of the respirator during the first few months.

The length of the exercise periods is gradually increased on the basis of absence of fatigue, an increase of vital capacity, and the findings on testing of the patient by the physician and physical therapist.

During the first six months after onset, exercise periods lasting more than about five minutes usually require a fractional diaphragm plus chest capacity of at least ten per cent of the vital capacity standard for the patient. One should not count the volume fractions produced by the neck and abdominal muscles, nor by the chest if the diaphragm is paralyzed.

During these first few months the neck accessories may be strengthened but not as part of the breathing patterns, particularly if it is expected that the neck accessories will eventually be needed at least for reserve.

In time, the periods for practice will increase in length so that more than four, three, or even two times daily become impractical because of hospital routines, and also they may cause accumulated fatigue because of the large amount of total time during the day.

After the patient's progress is quite consistent it may be feasible to prescribe an increasing schedule such as: "out two hours, two times daily with an increase of fifteen minutes two times weekly."

All the time it should be remembered that fatigue, exhaustion, and even chronic anoxia may be so insidious that they may be overlooked, but their effects tend to be cumulative, and they manifest themselves in many ways. They are frequently confused with simple primary psychological derangement and the patient may be felt to be malingering and insubordinate.

The symptoms of chronic impairment due to prolonged lack of sleep, physical exhaustion, and anoxia include subjective fatigue, irritability, unreasonableness, loss of appetite, nausea, loss of weight, malnutrition, drowsiness, loss of muscle strength and endurance, drop in vital capacity, rapid production of deep sleep when the patient is placed in the respirator, disturbance of stomach and bowel function, anemia and other changes in the blood, an increased tendency to secondary infections, and finally death may result from damage to the nervous system as well as from lack of somatic nutrition. Morale, one of the most important factors, may be depressed and in turn will further depress every function of the body. The loss of hope is almost certain to cause death in some patients.

One of the greatest problems to be met in the program of respirator weaning is sleeping out of the respirator at night. This is evident when one considers that respiration during sleep has to be completely automatic. It is no problem at all when there is sufficient return of the diaphragm or diaphragm plus chest function. It is a great problem though, when the diaphragm is markedly weakened (fractional capacity of about five per cent of vital capacity standard or less when it is the only muscle weakened). Some cases can never be fully weaned at night even though they are able to be out of the respirator all day long. When the patient has been out on a bed twelve to fourteen hours every day one may try one night out of the respirator. If this is well tolerated a schedule of every second or third night may be tried a week or more, then two or three nights out in a row, and finally completely out as a standby respirator case. During this period of transition the vital capacity as well as clinical evidence of breathing impairment should be watched closely. The possibility that the patient may need to return to the respirator should be kept in mind, especially in the event of a respiratory or a urinary infection, or a gastrointestinal disturbance. A patient with paralysis of the abdominal muscles is prone to develop complications such as atelectasis and pneumonia from upper respiratory infections.

After a patient has been weaned from the respirator completely, vital capacity studies and clinical observation of his status should be continued for some time, in some cases for years.

It has been previously stated in this section, that the use of the neck accessories for breathing should be avoided during the time when the patient is developing the proper muscles for breathing. The time comes in many cases when it becomes permissible and even advisable for the patient to use the neck accessories for breathing, this time may be four, six, or even twelve months after onset. Previous to this time the patient should be encouraged to develop the strength of these muscles by neck exercises. Some patients are able to be out of the respirator all day long using accessory muscle action. Although some are able to sleep out of the respirator using the accessory muscles only, this is usually a difficult matter and requires more than usual care because of the danger of anoxia.

The use of the abdominal muscles as accessory muscles during expiration ordinarily should be discouraged.

Recently we observed a unique type of respiration called glossopharyngeal breathing that is similar to the method employed by the amphibia or the frog. By this method patients who are completely paralyzed, except for the muscles of the

larynx, the throat, the tongue and the mouth, can breathe independently for several hours and possibly all day.

TRANSPORTATION OF RESPIRATOR PATIENTS

It may become necessary to move the respirator patient from one hospital to another. If the patient has to be in a respirator all the time, it is placed upon a suitable vehicle, i.e. a truck, a plane or a train. Always it is imperative to make adequate arrangements with the receiving hospital. During transit a physician or nurse should always be in attendance and if indicated suction and oxygen should be available when needed. It is desirable to have a source of electric current so that the respirator does not have to be operated by hand. The patient should be prepared psychologically for the trip; on leaving he should be fastened securely in the respirator to avoid jolting, and it is desirable to stabilize the abdomen by means of an abdominal binder. The patient with very marked involvement should be moved by truck with a police escort to avoid stopping and starting, and the road which is least rough should be chosen. If the patient is to travel to high altitudes care should be taken to insure adequate ventilation. Usually if patients ventilate sufficiently, high altitude will not cause any disturbance, especially since they do not exert themselves physically.

SUMMARY

Some of the problems in the management of the poliomyelitis patient with respiratory difficulty have been discussed. The importance of an evaluation of the neurological requirements of the patient and of planning the treatment program to meet the protective and therapeutic needs of the patient has been considered.

BIBLIOGRAPHY

1. Best, C. H. and Taylor, N. B. The physiological basis of medical practice. Williams & Wilkins, Baltimore 1950 Ed. 5 pp. 344 et seq.
2. Duchenne, G. B. Physiology of Motion (Koplon translation). J. B. Lippincott, Philadelphia 1949.
3. Bronk, D. W. and Ferguson, L. K. Amer. Jr. of Physio. 1935 110. 700.
4. Gray, Henry. Anatomy of the human body (Warren Lewis). Lea and Febiger, New York 1936.
5. Austin, E., et al. A mirror for use on respirators. Arch. Phys. Med. Feb. 50, 31 pp. 74-75.
6. Burston, I. and Austin, E., et al. Treatment of bed sores in respirator patients. Phys. Therapy Rev. 30:7 (July) 1950.
7. Dail, C. W., Austin, E., et al. Transfer of respirator patients. Arch. Phys. Med. 31:592-595 (Sept.) 1950.

Meet Our New Contributors

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(Continued on page 393)

Tracheotomy in Poliomyelitis

Seymour R. Cohen, M.D., and Albert G. Bower, M.D.

While it is recognized that a small group of poliomyelitis patients have actual virus disease involvement of the vital centers of the brain which may cause death, repeated clinical observation warrants the conclusion that death is most commonly contributed to by progressive oxygen lack (anoxia), and carbon dioxide accumulation from obstruction of the airway by mucus, and the pulmonary complications such as atelectasis and pneumonia which may result.

It has been demonstrated that anoxia may produce as much destructive pathology in the central nervous system as the virus infection itself. The clinical symptoms of the disorientated, lethargic, acutely excited, or comatose patient which previously have been attributed to lesions caused by the virus, show rapid and dramatic clearing after the establishment of an adequate airway by tracheotomy.

This prompt improvement attests to the importance of anoxia and the associated carbon dioxide accumulation, occurring when there is a disturbance of the defense mechanisms, which prevent entrance of foreign material into the lung. These disturbances include:

1. Impairment of normal cord mobility resulting from adductor spasm of the vocal cords due to irritation of the larynx by oropharyngeal secretions. This condition usually produces a crowing type of respiration.

2. Impairment of the airway produced by laryngeal paralysis involving the abductor group of muscles.

3. Defective swallowing mechanism causing the oropharyngeal secretions to flood the trachea.

4. Defective cough due to impairment of the cough reflex or because of spinal paralysis which makes the cough ineffective.

5. Hypersecretion which commonly occurs in patients with involvement of the 5th, 9th, 10th, 11th and 12th cranial nerves, and when associated with one or more of the above conditions makes the whole problem more acute.

The development of anoxia early in the disease depends on an interesting series of events which may eventually result in pulmonary complications and death. Pharyngeal paralysis due to involvement of the 5th, 9th, 10th, 11th and 12th cranial nerves, together with the hypersecretion which commonly occurs in these patients, results in accumulation and pooling of secretions in the back of the mouth (the hypopharynx). With each inspiration these secretions may overflow into the trachea and actually be sucked into the tracheobronchial tree. This is more likely to occur when swallowing difficulty is present. If such a patient is placed in the respirator without any attempt to clear the drowned upper respiratory tract, his breathing ability is further embarrassed and ultimately lower respiratory tract disease such as pneumonia, tracheobronchitis or atelectasis will appear.

Tracheotomy by-passes the obstruction in the larynx and permits easy access for removal of the contaminated secretions which are literally drowning the patient. Thus adequate suctioning through the tracheotomy substitutes for the lost defense mechanisms which normally protect the lung from the entrance of foreign substances or permit their evacuation from the lower respiratory tract.

Ordinarily the use of the respirator alone is contraindicated when the patient is unable to clear his airway since it can only result in sucking the secretions deep into the tracheobronchial tree. When tracheotomy is done there is easy access for suction catheters to keep the airway clear and the respirator may be used without danger of complications.

When the patient is mentally alert, he constantly tries to expectorate the copious amounts of saliva to maintain a clear airway. This may be effective for a short period of time, but the attempt is very tiring, prevents sleep, and the patient's efforts may ultimately fail and he will die.

It is difficult to list definite and concise indications for tracheotomy, but it should be done early. It is not commonly understood that the accumulation of carbon dioxide which occurs with inadequate ventilation acts as a powerful narcotic to the respiratory center. If tracheotomy is put off too long, the narcotized respiratory center will be driven by the carotid bodies which respond to

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oxygen lack—the last line of defense. When tracheotomy is performed under these circumstances, oxygen is quickly supplied, the drive of the oxygen lack is removed, but the respiratory center is still inactive because of the accumulation of carbon dioxide.

Thus late tracheotomy may result in apnea and death unless one is able to provide prolonged artificial respiration until the respiratory center recovers from its narcosis.

In general, tracheotomy is necessary if there is:

1. Inability to clear the oropharyngeal secretions by coughing or swallowing.
2. Evidence of laryngeal obstruction due to either adductor spasm or abductor paralysis.
3. Recurrent episodes of cyanosis, especially during feeding.
4. Evidence of cerebral anoxia by symptoms of irrationality, restlessness, excitement or coma.
5. Rapidly progressing symptoms of bulbar involvement.
6. Need for respirator in a patient with bulbar symptoms.
7. Coma with inability to care for oropharyngeal secretions.

There have been no deaths which may be attributed to tracheotomy surgery itself. Mediastinal emphysema, subcutaneous emphysema and pneumothorax have been extremely rare, and the occurrence of these complications may be unassociated with tracheotomy surgery since they are frequently found in cases of respiratory obstruction without surgical intervention. Laryngeal stenosis has not occurred even in patients who have worn tracheotomy tubes for many months.

The advantages of tracheotomy are many but a few of the more important may be listed here.

1. The provision of an adequate airway.
2. Maintenance of an adequate airway by suctioning the secretions from the lower respiratory tree. This assists in the prevention of pulmonary complications.
3. Use of bronchoscopy without the cooperation of the patient and without causing him much discomfort, if suctioning alone is not adequate to remove obstructive mucus or mucous plugs which are infected and may result in atelectasis or pneumonia.
4. The use of the tracheotomy makes possible the use of intra-tracheal positive pressure with or without humidification when it is indicated.

Tracheotomy in itself is not life-saving if the personnel caring for the patient thereafter is not properly trained to keep the airway clear of secretions. This may require constant or intermittent suctioning, not just of the trachea itself but of the lower bronchi.

Many cases will require a tracheotomy opening for many months. The tracheotomy should not be closed (decannulization) unless the following conditions are present:

1. There must be complete return of swallowing.
2. There must be sufficient return of the cough with a tussic force sufficient to clear the respiratory tract.
3. The laryngeal muscles must permit maintenance of an adequate airway.
4. If the patient has weakness of the respiratory muscles which has made necessary the use of the respirator, he must show evidence of sufficient return of function to maintain adequate oxygenation of the tissues as shown by vital capacity readings.
5. There must be no evidence of a pulmonary complication which indicates bronchial obstruction, particularly atelectasis.

Our Book Reviewers for July

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The Use of a Ventilation Meter* in the Evaluation of the Poliomyelitis Patient with Breathing Difficulty

Elizabeth Austin, M.D., Clarence W. Dail, M.D., David Ruben, M.D., Albert G. Bower, M.D., and Ruth Nygren Ackley

The evaluation of the poliomyelitis patient with breathing difficulty has long been a difficult problem, and it is now generally recognized that frank respiratory failure should not be allowed to occur. With acceptance of the fact that inadequate ventilation may be an insidious thing, and that the older criteria for using mechanical breathing assistance are useful only late when anoxia and carbon dioxide excess may have already done irreversible damage, it has become necessary to develop some way of evaluating these patients early in the disease.

Placing the patient in a respirator is a traumatic experience for him and his family, and in the past this was put off as long as possible because there was no method to measure his breathing ability before the onset of late symptoms indicative of actual asphyxia. It is an accepted fact that anoxia can cause as much or more damage in the nervous tissues than the neurotropic virus itself. Consequently protection of the patient from asphyxia becomes the responsibility of those treating him.

This need was met with the development of the Bennett Respiratory Ventilation Meter in 1949 which provides a method to quickly determine the actual breathing volume of these patients. It has been specifically designed to measure tidal air as well as vital capacity, and will record volumes as small as 10 and 15 cc. It is sufficiently accurate for clinical use through the range of breathing encountered in children and adults.

Thus we have a simple and rapid method of evaluating the patient's breathing capacity when he is breathing independently; when he is maintained on negative intra-tank pressure; on combined intra-tank negative and intratracheal positive pressure, and on intratracheal positive pressure alone. Consequently it is now possible to:

1) Anticipate respiratory failure and to give the patient breathing assistance by the use of the respirator before he becomes dangerously asphyxic and develops marked respiratory acidosis due to accumulation of carbon dioxide in the lungs.
2) Determine and thus control the adequacy of ventilation produced by the respirator.
3) Recognize certain pulmonary complications.
4) Determine the return of respiratory function so that he may be removed from the respirator without fatigue and with the maintenance of as much residual breathing capacity as possible.
5) Estimate the prognosis early in the disease concerning the possible return of breathing capacity.

It will be well at this time to define certain terms which must be understood in using this device.

Tidal air: the amount of air which is inspired or expired during each quiet breath or during each cycle of the respirator.

Minute volume: is obtained by multiplying the tidal air in cubic centimeters by the number of respirations per minute.

Vital capacity: the maximum amount of air in cubic centimeters which can be forcibly inhaled after a maximum expiration or vice versa.

Four types of respirator pressures are available. Of these, we routinely use three.

1) *Intra-tank negative pressure* produced inside the body type respirator. This will be referred to as "negative pressure."
2) *Intratracheal positive pressure* which is supplied at the tracheotomy orifice by the Bennett positive pressure respirator attachment. This will be called "positive pressure."

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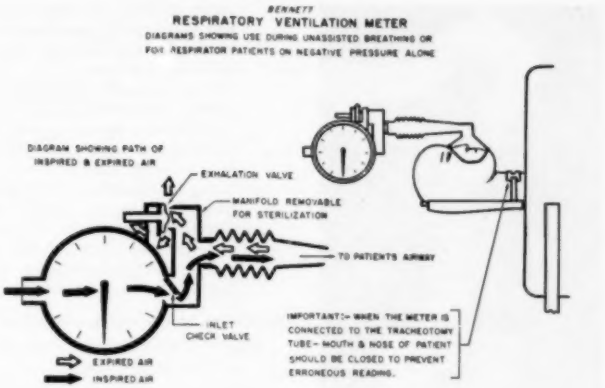
BENNETT
RESPIRATORY VENTILATION METER
DIAGRAMS SHOWING USE DURING UNASSISTED BREATHING OR
FOR RESPIRATOR PATIENTS ON NEGATIVE PRESSURE ALONE
DIAGRAM SHOWING PATH OF INSPIRED & EXPIRED AIR
EXHALATION VALVE
MANIFOLD REMOVABLE FOR STERILIZATION
TO PATIENTS AIRWAY
INLET CHECK VALVE
EXPIRED AIR
INSPIRED AIR
IMPORTANT:- WHEN THE METER IS CONNECTED TO THE TRACHEOTOMY TUBE- MOUTH & NOSE OF PATIENT SHOULD BE CLOSED TO PREVENT ERRONEOUS READING.

Figure 1

Used with permission of Annals of Western Medicine and Surgery.

3) *Combined pressure* which is a combination of intra-tank negative pressure and intra-tracheal positive pressure.
4) *Intra-tank positive pressure is rarely used.* This refers to the positive pressure which may be developed in the tank type respirator during expiration.

All measurements on the respiratory ventilation meter are made during inspiration for the following reasons:

1) To prevent contamination of the working parts of the meter when used on contagious cases.
2) To prevent damage to the fine working parts of the ventilation meter from water vapor condensation that might occur in the instrument because of the high vapor content of the expired gas.
3) To permit measurement during positive or combined pressure breathing.

Tidal air measurements are of greatest value in determining adequate respirator settings. They are not of great help in unassisted patient breathing since many patients can alter tidal air values by their own efforts. Even in the respirator, however, it is necessary to evaluate the factor of voluntary "augmentation" and make correction for it.

Vital capacity readings are most valuable in determining when the patient should be placed in the respirator for breathing assistance, and when he may be removed safely. It has been shown that the patient can maintain his tidal exchange until the vital capacity drops to approximately one-third normal (range: $\frac{1}{4}$-$\frac{1}{2}$). The tidal air, and concurrently the minute volume, then begins to decrease. Consequently, the vital capacity reading is a simple, rapid, consistent, and objective method of evaluating the patient's respiratory adequacy, noting changes indicative of progression and limitation of capacity and thus preventing the development of asphyxia.

Method of using Bennett respiratory ventilation meter

1) If the patient is obviously in severe respiratory distress, the use of ventilation readings is not indicated and he should be given artificial respiration with the tank type respirator as soon as possible. Vital capacity tests are for the *early* detection of inadequate volume.
2) If the patient is rational, reassure him.
3) If a mask is used, be sure it fits snugly. Tell the patient to breathe with his mouth open (See Figure 1).
4) If a tracheotomy adapter is used, it must correspond in number with the tracheotomy tube number. The high resistance of a very small tube may impair the reading. Thus, a No. 1 tube makes accurate ventilation tests impossible, and a No. 2 tube also presents difficulties even in a child. The smallest tube which will give an adequate evaluation in an adult is a No. 4. The nose and mouth must be held closed to avoid inaccuracies (See Figure 3).
5) The airway must be clear; adequate suctioning must precede each test.
6) When the meter is properly attached to the patient by one of the two methods

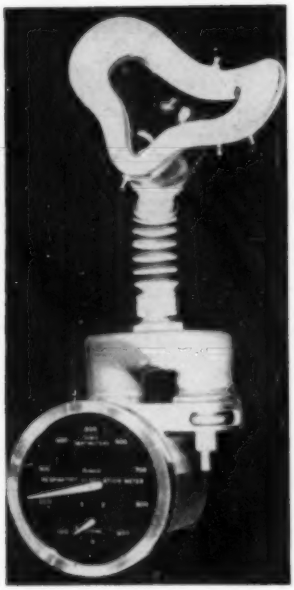

Figure 2. Bennett respiratory ventilation meter attached to mask.

(mask or intratracheal adapter) he is instructed to breathe normally for several breaths and as he becomes accustomed to the procedure, his breathing will become stabilized and a tidal reading may be taken if desired. This is of great importance in obtaining adequate respirator settings.

7) The vital capacity reading is obtained by instructing the patient to take a moderately deep breath, to exhale it all (using chest compression if possible), and then to take as deep a breath as possible.
8) When the patient is cooperative and in no great distress, several vital capacity readings are taken each time he is evaluated. The first one is to be sure that he understands the instructions so that he may cooperate well, and to rid him of fear of the mask and meter.
9) The untracheotomized patient with excessive mucus whose airway cannot be adequately cleared is not checked for vital capacity because of the danger of aspiration of some of the mucus when a large breath is sucked into the lungs, with resulting atelectasis.
10) There is generally a delay before ventilation readings are taken following a tracheotomy.
11) The breathing pattern and relative power in the muscles of respiration (including the abdominals) is always evaluated before the ventilation test is carried out. This will help one to assay the ventilation test with greater accuracy.

Precautions in evaluating ventilation tests

1) *The airway must be clear.* An impaired airway may give an abnormal reading.
2) The patient who has a very low vital capacity may not be able to cooperate well in carrying out prolonged ventilation procedures as he readily becomes anoxic, restless, and apprehensive. Therefore great skill and speed are needed to get an adequate vital capacity reading.
3) The comatose patient cannot cooperate in taking readings, and consequently the physician will have to depend on his clinical evaluation of muscle weakness and breathing patterns to determine early breathing difficulty.
4) Small children must be clinically evaluated because they do not know how to cooperate and are easily frightened by a strange procedure.
5) Evaluation of muscle weakness in relationship to ventilation tests is essential. The patient must not be allowed to

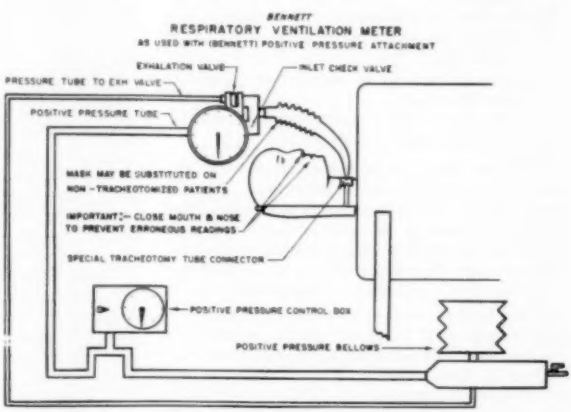
BENNETT
RESPIRATORY VENTILATION METER
AS USED WITH (BENNETT) POSITIVE PRESSURE ATTACHMENT
EXHALATION VALVE
INLET CHECK VALVE
PRESSURE TUBE TO EXH VALVE
POSITIVE PRESSURE TUBE
MASK MAY BE SUBSTITUTED ON NON-TRACHEOTOMIZED PATIENTS
IMPORTANT:- CLOSE MOUTH & NOSE TO PREVENT ERRONEOUS READINGS
SPECIAL TRACHEOTOMY TUBE CONNECTOR
POSITIVE PRESSURE CONTROL BOX
POSITIVE PRESSURE BELLOWS

Figure 3. Used with permission of Annals of Western Medicine and Surgery.

TABLE 1

VITAL CAPACITY STANDARDS

	Ages 3 — 20 Years				*Ages 20 — 55 Years*		
	Age Standard	Average Height			Height Standard		
	MALE		FEMALE		MALE		FEMALE
Age	*V.C.*	*Ht. Inch*	*V.C.*	*Ht. Inch*	*V.C.*	*Ht. Inch*	*V.C.*
3	.60	36	.46	36	3.61	57	2.90
4	.80	39	.62	39	3.67	58	2.95
5	.95	42	.82	41	3.74	59	2.99
6	1.13	45	1.00	44	3.80	60	3.05
7	1.30	47	1.20	47	3.85	61	3.09
8	1.46	49	1.34	49	3.92	62	3.15
9	1.66	51	1.50	51	3.99	63	3.20
10	1.83	53	1.63	53	4.05	64	3.25
11	2.02	55	1.88	55	4.12	*65	*3.30
12	2.20	57	2.10	57	4.19	66	3.35
13	2.47	59	2.35	60	4.25	67	3.40
14	2.76	62	2.51	62	4.31	68	3.45
15	3.06	64	2.70	63	*4.37	*69	3.51
16	3.37	66	2.82	64	4.44	70	3.56
17	3.68	67	2.97	64	4.50	71	3.61
18	3.97	68	3.09	65	4.56	72	3.66
19	4.27	69	3.20	65	4.62	73	3.72
20	4.37	69	3.30	65	4.69	74	3.77
		(Age 20 same as average adults)			4.75	75	3.82
					*Average		

The vital capacity values indicated above are for the patient of average height. If patient is not of average height, determine his vital capacity standard from adjacent height column.

For ages 36-45 subtract 4% from the vital capacity indicated above. For ages 46-50 subtract 8%; 51-55 12%; 56-60, 16%; 61-65, 20%; and from 66-70 subtract 25%.

The age standard table was adapted from Stewart, C. A. and Sheets, O. B.: Am. J. Dis. Child., 24:83, 451, 1922 and from Barach, J. H.: Am. J. Dis. Child., 69:92, 1945. The height standard table was obtained from determinations by Myers, J. A.: Vital Capacity of Lungs. Baltimore, Williams and Wilkins Co., 1925. Figures for deductions for ages above 36 years were calculated from studies by Bowen, B. D. and Platt, D. L.: Arch. Int. Med., 31:579, 1923. The height standard for adults was chosen because of its simplicity and because it has been shown to be as reliable as the surface area standard; see Shepard, W. B. and Myers, J. A.: Arch. Int. Med., 35:337, 1925. Data obtained in part from Sunderman, F. W., and Boerner, F.: Normal Values in Clinical Medicine. Philadelphia & London, W. B. Saunders Company, 1949.

augment tidal air by the use of accessory muscles early in the disease. An adult male patient has shown a tidal air of as much as 700 cc. using normal neck muscles in the presence of complete diaphragm and intercostal paralysis.

6) Tidal air readings are most accurate when the patient is breathing quietly with the respirator. However, he readily becomes aware of quiet breathing as soon as any procedure is begun such as using a mask or holding the nose and mouth closed. Thus he may be unable to relax enough to permit passive tidal air measurements.

Furthermore marked apprehension may cause a type of laryngo-spasm even in a well stabilized patient and this will interfere with these readings.

Present criteria for placing the patient in the respirator

1) Ventilation tests are repeated two or three times daily on all patients whose vital capacity is 70 per cent or less of the calculated normal (See Table 1) and may be done hourly on one who is progressing rapidly.
2) When the vital capacity drops to 25 per cent of calculated normal, he is placed in the respirator whether there are clinical signs of respiratory deficiency or not.
3) If the patient cannot be adequately evaluated by the ventilation test, or if he shows clinical evidence of disturbed breathing patterns or fatigue, he should be placed in the respirator for a rest even if the vital capacity has not dropped to 25 per cent of

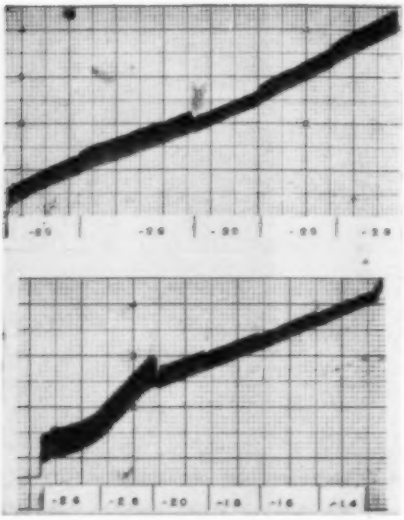

Figure 4. Graphs—tidal air measurements of completely paralyzed patient at different intra-tank negative pressures, taken with specially adapted McKesson type basal metabolator.

Figure 5. Bennett respiratory ventilation meter with tracheotomy adapter to the right and attachment to positive pressure on left.

normal. This is particularly true when the diaphragm is paralyzed.

Muscle weakness and normal and abnormal breathing patterns are discussed in another article of this series. (See Page 339.)

Ventilation tests to determine and control adequacy of ventilation in the respirator are done as soon as the patient receives breathing assistance unless he has just been tracheotomized. In the latter case, settings are empirical for several hours and then an evaluation is made.

This is done because of the frequent suctioning required. Often the patient is apprehensive and disturbed by the tracheotomy procedure. Therefore the rate and pressure should be set so that the patient is comfortable and his chest is moving well, and he is coordinating with the respirator. He is carefully watched for air hunger (hypoventilation) or hyperventilation. The settings are checked with the ventilation meter two or three hours later.

Not so long ago respirator settings were entirely on an empirical basis. The fallacy of this method is well illustrated in the graphs in Figure 4, which show the amount of tidal air which was provided by a standard Drinker-Collins respirator at various settings for a patient with completely paralyzed respiratory muscles. The test was done with a specially adapted McKesson type basal metabolator.

With the Bennett respiratory ventilation meter, it is possible to evaluate the amount of tidal air which the patient is receiving whether he is being maintained on negative intra-tank pressure or combined positive intratracheal and negative intra-tank pressure. There is considerable disagreement in the literature about the optimum tidal volume, Cohen reports an average of 743 cc. for healthy young males, while Best and Taylor indicate that 500 cc. is the usual tidal air. We have found the following figures helpful in handling over three hundred respirator patients in the acute phase of the disease.

Adult females: average ventilation: 450-600 cc. at rate of 18 (See Table 4)

Adult males: average ventilation: 500-700 cc. at rate of 16 (See Table 5)

TABLE 2

TIDAL AIR USED TO VENTILATE CHILDREN IN THE RESPIRATOR — 1951

MALES	*Age Yrs.*	*Ht. Ins.*	*Wt. Lbs.*	*Rate*	*Press.*	*T.A.*	*Press.*	*T.A.*	*Press.*	*T.A.*
1	1	31	26	26	+12 −15	150	+13 −16	150	+10 −14	175/200
2	1	33	35	24	+12 −15	200/225	+12 −17	175	+12 −15	200
3	2	35	26	26	+ 8 −10	100	+14 −14	100/175		
4	3			28	+10 −17	225	−20	150/200		
5	4	44	42	28	+ 8 −14	250/275	+ 6 −10	275/300	−12	200
6	4	43	41	22	+10 −10	260	+10 −10	200	+12 −14	225
7	5	44	43	24	+15 −10	275	+ 8 −10	250	−18	200
8	5	44	39	24	+13 −18	225/250	+ 6 −13	250	+ 7 −19	250
9	6	49	60	28	+ 6 −10	250	+ 8 −12	400	+ 8 −12	300/325
10	6	48	61	24	−19	175/200	+10 −15	350/375	+ 8 −10	350
11	7	51	70		−22	300	−18	325	−18	350
12	8			25	−18	250	+12 − 8	300	+ 8 −10	325
13	8	48½	60	22	+ 7 −10	200	+ 7 −10	300	−18	250
14	9	55½	65	18	+ 6 − 9	350/375	+ 6 − 9	375	+ 5 − 9	375/400
15	10	51	98	20	−12	250	−15	300	−17	300
16	10	54	66	24	+ 5 −10	300	+10 −12	300/325	+ 8 −12	300/325
17	11	62	126	18	−10	375/400	−17	325	−17	350
18	11	55½	100		−25	250/300	+ 8 −14	350	+ 8 −12	350/375
19	12	63½	112		+12 −16	425	+10 −14	400/425	+10 −16	450
20	12	57	103	24	+ 5 − 9	400	+ 8 −10	400	+ 9 −12	400

Tables 2 and 3 show ventilation of children maintained in the respirator during the acute phase of poliomyelitis in 1951. No attempt has been made to include an evaluation of muscle weakness or lung pathology. The tables well illustrate the different pressure settings needed to maintain the same ventilation.

Normal tidal air measurements for children have not been well documented. Consequently, these have been set empirically, and Tables 2 and 3 are included to illustrate the pressures and tidal air at which children under the age of 12 were maintained here in 1951. Further evaluation of children's requirements needs to be done.

In the past one of the most common mistakes in handling the breathing requirements of these patients was to assume that changes in pressure adjustment of the machine would be reflected in proportional changes in respiratory exchange. Thus, it was assumed that a change of 2 cm. of water would result in comparable changes in tidal air. However, it has been shown by Bower et al, that an increase of 2 cm. of water pressure in one patient may result in an additional 75 cc. of tidal

TABLE 3

TIDAL AIR USED TO VENTILATE CHILDREN IN THE RESPIRATOR — 1951

FEMALES	Age Yrs.	Ht. Ins.	Wt. Lbs.	Rate	Press.	T.A.	Press.	T.A.	Press.	T.A.
1	5 mo.			38	+ 7 −21	100/125				
2	1			38	+12 −15	125/150				
3	1		22	28	+ 6 −12	125/150	−22	100	−16	100/125
4	2	35	25	28	+12 −14	200/225	+13 −16	200	+ 8 −12	150/200
5	2	40	41	32	+16 −18	225	+16 −18	250	+14 −18	250
6	3	43	42	28	+10 −13	200	+ 8 −13	200	+10 −13	200
7	3	36	28½	28	+15 −20	225	+12 −20	220	+14 −18	200
8	4	42	40	34	+ 6 −14	150/175	−23	150/175	−18	125/150
9	4	40	42	28	+ 7 −10	200	+ 9 −12	200	+ 5 −10	200
10	5	44	45	24	+12 −15	275	+14 −15	275	+14 −17	250
11	5	44	47	24	−15 +12	250/275	+12 −16	275	+10 −15	
12	6	45	47	26	+ 5 −10	200/250	−18	150/200		
13	6	47	40	24	+ 8 −12	225	+ 8 −10	200	−15	150/200
14	7			24	+ 9 −11	250	+ 5 −10	300	+ 7 −10	250/275
15	7	38	35	28	−18	175	−20	200	−10 +10	175
16	8		52	18	+10 −15	350	+ 8 −15	325/350	+ 8 −14	350/375
17	8	51	61½	23	−12	250/300	−10	250/275	−12	275/300
18	9			24	+ 6 −14	325	+ 8 −14	340	+12 −14	375
19	9		52	24	+ 8 −11	250	+ 5 −10	250	+ 7 −11	275
20	10		96	26	+ 8 −10	350	+ 8 −11	350	+ 7 −10	350
21	10		84	21	+12 −15	375/400	+10 −12	400/425	+15 −19	350/375
22	11	58½	78½	20	−20	250/275				
23	11	48	90	24	−18	300/350				
24	12	59	101	24	+ 5 − 8	350/400	+ 4 − 8	400/450	+ 5 − 6	425/450
25	12	62	100	22	+ 5 −11	400	+ 7 −11	400	+ 7 −10	500/525

air, while in another patient, it may result in 250 cc. increase in tidal air.

Pressures must be individualized, and can only be determined by individual tests with the ventilation meter. Ventilation tests on acutely ill respirator patients are done twice daily to adjust respirator pressure settings for their needs may be changing rapidly.

TABLE 4

TIDAL AIR USED TO VENTILATE ADULTS IN THE RESPIRATOR — 1951

FEMALES	*Age Yrs.*	*Ht. Feet*	*Wt. Lbs.*	*Rate*	*Press.*	*T.A.*	*Press.*	*T.A.*	*Press.*	*T.A.*
1	29	5'5"	130	20	−10	450	−16	400/425	−10	350/400
2	28	5'4"	130	19	−19	450/475	+ 7 −10	550	+ 5 −10	575/600
3	25	5'6"	145	18	−13	500/525	−13	500	−18	500
4	34	5'3"	130	18	+10 −15	550	+ 8 −12	550	+ 9 −12	525
5	27	5'3"	107	18	+ 5 −10	500	+ 4 −10	525	−14	400
6	31	5'4"	117	18	+ 5 −10	500	+ 8 −10	500/525	+ 9 −12	500
7	35	5'6"	132	20	−15	450/500	−13	450/500	−13	500/550
8	14	5'5"	121	18	−18	400	−16	400	−14	300/550
9	25	5'6"	100	17	−17	500	−14	500	−14	475/500
10	30	5'6½"	132	18	+10 −12	500	+ 6 −10	500/525	−17	400
11	24	5'7"	130	22	+10 −13	700	+10 −12	600	+10 −13	600
12	23	5'3"	135	17	−15	500/525	−10	600/700	−15	500
13	19	5'7"	131	18	−17	425/450	−15	425/450	−14	450/475
14	22	5'6"	136	18	−15	500	−13	450	−11	475/500
15	26	5'2"	110	18	+12 −14	500/525	+ 9 −12	525/550	+10 −12	450
16	17	5'7½"	131	20	+10 −10	650	+10 −12	675	+10 −14	450
17	36	5'6"	135	20	+12 −17	550	+ 8 −13	550	+ 8 −14	550
18	24	5'4"	110	18	+ 5 −10	475/500	+ 6 −14	500	+ 8 −13	500
19	27	5'7½"	165	18	−19	400/500	−16	500	−16	500
20	33	5'3½"	110	17	+ 8 −15	500/525	+ 8 −10	500	+ 7 −10	500

Tables 4 and 5 show ventilations on adult patients during the acute phase of the disease in 1951. Note again the different pressure settings needed to maintain the same ventilation in the same patient and the variations between patients.

The syndrome of acute hyperventilation is an unusual occurrence with properly set respirator pressures. Subjectively, the patient complains of numbness and tingling of the extremities. Objectively, he may become apprehensive and have hallucinations, the lips become cherry red, and carpopedal spasm may occur.

These findings are readily controlled by reducing the pressure or by opening a porthole for a few minutes.

Hyperventilation may be used to depress the erratic control of the respiratory center in the bulb when the latter is interfering with adequate coordination with the respirator. It must, however, be carefully regulated, and the patient must be under skilled observation.

More frequently inability to coordinate with the respirator results from an obstructed airway and is remedied by adequate suctioning.

TABLE 5

TIDAL AIR USED TO VENTILATE ADULTS IN THE RESPIRATOR — 1951

MALES	*Age Yrs.*	*Ht. Feet*	*Wt. Lbs.*	*Rate*	*Press.*	*T.A.*	*Press.*	*T.A.*	*Press.*	*T.A.*
1	28	5'10"	165	18	−20	450/500	+ 4 −14	850	+ 4 −14	800
2	25	5'9"	150	20	−20	550/600	−18	550/600	−15	600
3	22	5'8½"	145	18	−17	525/550	−17	400	−18	500/525
4	28	5'9"	145	17	−18	550/575	−22	600	+10 −18	600/625
5	34	5'9"	150	23	−12	600/650	+10 −15	650	+12 −18	650
6	42	6'	175	16	+ 7 −14	700/725	+10 −16	700	+ 7 −10	700
7	24	5'8½"	152	18	−20	500/550	−22	550/575	−19	550
8	30	6'	160	16	+10 −15	675	+10 −12	600	+12 −12	625
9	36	5'8½"	130	17	+ 8 −16	650/700	+10 −16	625/650	+10 −18	525
10	32	6'	180	17	−18	550	−17	550/575	−20	575
11	29	5'9½"	170	16	−20	600	+ 7 −15	600	+12 −18	600
12	30	5'8"	145	16	−18	600	+ 9 −11	650	+ 7 −14	700
13	20	5'10"	130	20	−20	375/400	−14	300	−20	350/375
14	29	5'8½"	140	22	+ 5 −10	550/600	+ 6 −13	500/550	+ 9 −15	550/600
15	22	5'11"	170	18	−18	550	−17	550/575	−14	750/800
16	45	5'9"	160	18	+ 6 −12	575	+ 5 −12	575	+ 5 −13	575
17	30	5'10"	105	18	+15 −17	800	+11 −13	800	+20 −20	800
18	40	5'10½"	150	18	−18	600	−15	650	−18	600
19	31	6'11"	163	17	−15	600/650	−18	500/500	−17	550
20	28	6'3"	208	18	−15	500/550	−16	550	−18	600/650

Augmentation is the term we use to indicate that the patient has some residual muscle power and is not breathing passively in the respirator. He is "adding to" the passive tidal volume supplied by the respirator. This happens most often when he is excited and particularly when he is being tested. This will result in low respirator settings if the muscle power is minimal, but will result in hyperventilation if the muscles have moderate power and do not fatigue readily. At the same time these muscles may not have power enough to maintain the patient free from the respirator.

Augmentation is usually present when the tidal volumes noted with successive breaths vary. When passive breathing only is present, the tidal volumes are uniform on any one respirator setting.

Instructions for testing tidal air provided by respirator pressures

1) The airway must be clear; it may be necessary to suction the patient before and during the test. An obstructed airway may result in incoordination.
2) All porthole gaskets must be tight and the collar must fit well or leaks may give an erroneous reading. Check the pressure settings carefully.

3) Remember that each individual will require different pressure settings to obtain an adequate tidal air. This may be due to the resistance of the rib cage, the size of the chest, the resistance of the tracheotomy tube, etc.
4) It is customary to test the passive tidal air at a number of pressure settings, carefully noting them on a special form (See Table 6). The resident physician then selects the tidal volume which he wishes used for the patient. The settings which will produce the desired volume are then written on tape placed under the pressure gauge on the respirator and everyone working with the patient must maintain them.
5) Intra-tank negative pressure settings are effective up to 20-25 centimeters of water. When more ventilation is required than the negative pressure alone can produce, combined pressure (intra-tank negative plus intratracheal positive) is used. At times combined pressure is used without the above criteria being present in an attempt to reduce excessive mucus.
   a) When combined pressure is used the negative pressure is usually set slightly higher than the intratracheal positive pressure (For example: negative 10, positive 8).
6) During the febrile course of the disease, higher pressure settings are more likely to be necessary than later when the patient has become stabilized.
7) During the early part of the disease, respirator settings are checked two or three times a day. Thus while we may try to ventilate the patient on the same tidal air, this may be produced at different times by different respirator settings (See Table 6). As the patient becomes stabilized and afebrile, settings may be done daily, then every other day, and finally two times a week. However, respirator tidal air measurements are done whenever the patient complains of air hunger, or hyperventilation is suspected.
8) If the amount of pressure required to maintain the patient on one specific amount of tidal air increases suddenly, a thorough suctioning may be necessary. If it still requires a marked increase to maintain him, lung pathology may be suspected.
9) When attaching the meter into the positive pressure system (for measuring combined pressures) the negative pressure must be increased to maintain the patient while the positive pressure is disconnected.
10) Incoordination prevents accurate measurements. It is most commonly caused by an obstructed airway, but may also be due to laryngeal spasm, or primary bulbar involvement.
11) When the patient augments, explain to him that you wish him to relax, and if he can, usually he will.

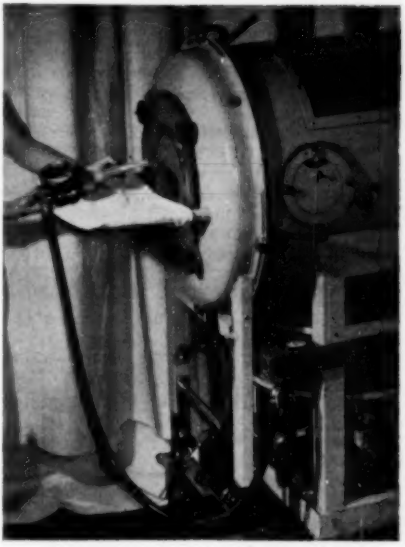

Figure 6. Bennett respiratory ventilation meter connected to positive pressure apparatus and with tracheotomy adapter. This connection is used for checking intratracheal positive pressure breathing or combined intratank negative and intratracheal positive pressure.

Intratracheal positive pressure for nursing care is used for the patient who has insufficient breathing capacity. It has resulted in easier nursing care, while protecting the patient from asphyxia.

While the patient is critically ill with fever, irrationality, coma, or air hunger, all care is given through the portholes and he is not permitted to breathe independently for *any* purpose.

When he becomes afebrile and apparently is medically stabilized he is evaluated for the use of intratracheal positive pressure breathing for short periods, e.g., five minutes.

TABLE 6

RESPIRATORY VENTILATION TESTS

Ventilation tests on one patient in five day period.

(−) Resp. Pressure = Neg. Intra-tank
(+) Resp. Pressure = Pos. Intratracheal
T.A. = tidal air in cc.
V.C. = vital capacity in cc.

Patient No. 43 age 26 — Female

Date	*Hour*	*Press. Resp.*	*T.A.*	*V.C.*	*Remarks*	*By*
10/28	10:00 am			2000	Limited chest excursion. Abdominals good Diaphragm appears good, cough good	RNA
	3:00 pm			1400	Difficulty swallowing, some mucus	RNA
	9:30 pm			1550	Incr. swallowing difficulty. Fatigued	JC
10/29	6:00 am			1200	Mucus pooling, swallowing very poor	JC
	9:00 am			1025	Excessive mucus. Abdominals poor, cough poor. Diaphragm poor, intercostals trace (Staff decides needs tracheotomy and respirator)	RNA
	10:00 am			1000	Tracheotomy and gastric tube, stat	RNA
	11:00 am			975	Respirator stat	RNA
	11:30 am	+ 8 −10			Empirical setting coordinates well, comfortable and resting well. Much mucus	RNA
	3:30 pm	+ 5 −12	600/700		Rate 18. Patient complains of too much air	JC
		+ 5 −10	600		Rate 18. Still too much air	JC
		+ 5 − 9	550		Rate 16. Used (falls within normal range, patient tolerates it well)	JC
10/30	9:00 am	+ 5 − 9	475			RNA
		+ 8 −10	550/575		Rate still 16. Used. Patient more comfortable	RNA
	4:00 pm	+ 8 −10	450		Patient has been suctioned well but tidal air still low	JC
		+ 9 −12	550		Used to maintain same ventilation which staff feels best suits patient	AB
				450	Out of respirator P. diaphragm O Intercostals	JC
10/31	9:00 am	+ 9 −12	400		Complaining of air hunger	RNA
		+13 −16	525		Best we can do in spite of good suctioning. Request doctor to check regarding tracheotomy change.	RNA
	11:00 am				Tracheotomy tube changed	SC
	11:30 am	+13 −16	875		(Note increased tidal air on same pressure!)	AB
		+ 8 −12	575		(Pressure reduced to avoid hyperventilation) Used.	AB
				250	Out of respirator on own	JC
	4:00 pm	+ 8 −12	550		Used. Fever dropping, patient more rational	JC
11/1	9:00 am	+ 8 −12	575		Used. Patient in pretty good shape	AB
		+20	550		Patient closes glottis well. Can tolerate positive pressure breathing for nursing care five minutes every three hours.	AB

Onset Date	Normal Calculated V.C.	Wgt. in pounds	Height in Inches
10/27/51	3250 cc.	130	64

1) Check pulse before beginning test. A rise of twenty points will indicate immediate return to respirator breathing.
2) Turn up negative pressure while inserting ventilation meter in line. Reassure patient during procedure.
3) Set positive pressure to +20. Open porthole or pull out carriage; patient will then be breathing on positive pressure.
4) Air may be lost through the nose and mouth, particularly if there is pharyngeal or laryngeal paralysis. Check this by placing your hand over the nose and mouth. Air will be lost here during *inspiration*. If this occurs, the patient must be taught to close glottis to trap the air so it will all go down to the lungs. It may take several training periods to accomplish this.
5) With the ventilation meter and the glottis closed, a positive pressure setting for nursing care can be obtained.
6) Always turn the mirror so that the positive pressure attachment into the trachea can be watched constantly. It can come out and this would cause asphyxia if it were not replaced quickly.

The use of ventilation tests to recognize pulmonary complications. Even in the presence of apparently adequate ventilation resulting from optimum respirator settings, pulmonary complications may develop as a result of aspiration, pneumonia, and atelectasis. Early recognition of these complications is extremely difficult in the respirator, and failure to treat them early may result in permanent lung damage or in death. Ventilation tests can indicate the presence of these complications immediately and before the onset of tachycardia, fever or leukocytosis, or in the presence of these findings from other causes (e.g., urinary infection).

A sudden drop in the tidal air which is passively produced by the respirator is an indication for thorough and expert suctioning, and if this is not effective, bronchoscopy may be indicated. X-ray findings will develop in a short period thereafter.

Ventilation tests may be used to evaluate the return of respiratory function, and are important so that the patient may be removed from the respirator as expeditiously as possible but without fatigue and with as much residual vital capacity as is compatible with his involvement.

Many clinicians still feel that as soon as a patient is placed in the respirator, attempts to remove him from it for increasing periods should be instituted. Progressive ventilation tests on several hundred respirator patients indicate that this policy can only result in increased damage to the patient which may prolong his stay in the respirator or may result in unnecessarily reduced residual vital capacity.

Progressive ventilation tests on patients in the respirator during the past two years indicate that the persistence of low vital capacities may give the physician some indication of the eventual prognosis for removing the patient from the respirator. Respirator patients are tested for active vital capacity (without respirator assistance) at frequent intervals. The findings indicate that patients fall into three groups:

1) *Group I:* Vital capacity drops to below 100 cc. with little return within three weeks from onset.

   Here the prognosis for complete freedom from respirator care is extremely poor. When some independence is achieved, which may take many months, the patient learns to live with a very low vital capacity and generally he must always use some form of breathing assistance during sleep.
2) *Group II:* Vital capacity drops to 100 cc. or below, but improves within three weeks after onset.

   The prognosis for freedom from respirator care is good for many of these patients, though it may be a long process and depends on the amount and distribution of respiratory muscle weakness.
3) *Group III:* Vital capacity does not drop below 100 cc.

   There is an excellent prognosis for recovery of respiratory function. When the lowest vital capacity noted is considerably above this figure, naturally, the prognosis is improved proportionately.

When the patient is first permitted to breathe independently of the respirator, it must be remembered that he has been acutely ill, and consequently he must not be allowed to become tired. Profuse perspiration, a pulse rise of more than 20 points, dilatation of the alae nasae, use of the accessory muscles, restlessness, and apprehension should be indications for immediate return to the respirator.

Progressive decrease in the vital capacity measurements of a well stabilized patient usually indicates subclinical fatigue and is an indication that the time out of the respirator should be reduced. In some instances it may take three or four days for the vital capacity to return to the prefatigue reading.

Criteria for removing the patient from the respirator, therefore, depend on the residual vital capacity of the patient, the breathing pattern he develops, and his remaining muscle power. These criteria may be rather generally grouped in relationship to the prognosis indicated by vital capacity tests which have been discussed.

Group I: The patient whose vital capacity drops below 100 cc. and remains there for a prolonged period of time is not removed from the respirator for independent breathing for any purpose during the acute stage of the disease. All medical, nursing, and physical therapy procedures are given through portholes or with the assistance of positive pressure breathing.

1) During this time, every effort is made to strengthen any residual power in the accessory muscles of respiration.
2) Some of these patients may be permitted gradually to breathe independently for a few minutes at a time, and eventually may be free from respirator assistance during the day, though usually requiring it for sleep.
3) Other patients however, never do develop a functional vital capacity, and can tolerate independent breathing only for a few minutes at a time.

Group II: Patients showing a drop in vital capacity to 100 cc. or below but showing improvement within three weeks after onset.

1) Independent breathing frequently is not permitted until the vital capacity is twice the estimated normal tidal air.
2) Time out of the respirator is carefully evaluated by the physiatrist and the physical therapist and then the time permitted is well within the patient's tolerance. When breathing capacity is marginal, no medical, nursing, or physical therapy procedures are permitted while the patient breathes independently.
3) Time out of the respirator is gradually increased.
   a. The vital capacity must increase or at least remain the same. Any marked drop in vital capacity is an indication of fatigue, and independent breathing time is decreased for several days until the vital capacity returns to its former reading.
   b. It is felt that the breathing pattern, particularly early in the disease, is very important. Substitution occurs most readily with fatigue. The use of accessory breathing muscles is discouraged until it is certain that the patient will have insufficient return of his normal muscles of respiration to maintain himself.
   c. Residual muscle power affects the breathing pattern. Furthermore, it exercises a marked influence on the rapidity with which the patient may be freed completely from the respirator.
      (1) The patient who has complete diaphragm paralysis and uses intercostals alone, readily uses accessory muscles. He fatigues rapidly and improves slowly. Short periods out of the respirator are prescribed at frequent intervals. Vital capacity may improve very slowly.
      (2) On the other hand, the patient with paralysis of the intercostal muscles and an intact diaphragm does not tire so readily, usually recovers more quickly, and his periods out of the respirator may be increased rapidly.
      (3) When both intercostals and diaphragm are weak, the duration of time out of the respirator will depend on the rate and site of return of muscle power.
      (4) The determination of ventilation requirements of small children is extremely difficult. In general, they are removed from the respirator cautiously and for brief periods at short intervals.

Group III: When the lowest noted vital capacity remains above 100 cc. the patient may be permitted independent breathing using the criteria above, and when the lowest vital capacity is considerably above 100 cc., he may be taken out of the respirator earlier and for longer periods of time.

1) When the patient in this category finally tolerates independent breathing for twelve hours daily without decrease in vital capacity for three days, he is permitted to sleep all night on a flat bed. The vital capacity is then measured in the morning, and if there has been no drop, sleeping on the flat bed is continued. If, however, there is a decrease in the vital capacity, he is returned to the respirator for one or more nights until he can maintain himself. There should be no hesitation in returning a patient to the respirator for an occasional night's rest, particularly if he has resumed completely independent breathing in a short time.

Routine ventilation orders

1) When the patient is placed in the respirator, ventilation studies are done to determine the optimum tidal air.
2) The pressure settings which will deliver this amount of air are ordered by the resident, and are written on tape and placed in a conspicuous place under the pressure gauge. They must be maintained at all times.

   When the patient is maintained on combined intratracheal positive pressure and intra-tank negative pressure, when suctioning is required, the positive pressure is ineffective, so that intra-tank negative pressure is increased during this procedure.
3) Pressure settings are done with the respiratory ventilation meter twice daily until the patient has stabilized; then daily, and finally two times weekly when his condition permits.
4) *The respirator may not be opened for any purpose* until an order is received from the ward resident. Portholes are used for nursing procedures, and the bedpan port must be opened only with the positive phase of the respirator (during expiration).
5) As soon as possible, the patient's ability to maintain himself out of the respirator with the assistance of intratracheal or mask application of positive pressure breathing is evaluated. Then orders are written permitting nursing care for short periods with the assistance of the positive pressure.

   For example "out of respirator on positive pressure at +20 for five minutes every two hours for nursing care."
6) Breathing independently of the respirator is permitted only after ventilation tests indicate that the patient can maintain himself and after a careful clinical evaluation of muscle power and breathing patterns has been made by the consulting physiatrist. The resident then orders the time out.
   a. For example "out of respirator five minutes every two hours except during sleep," or "out of respirator two hours, in respirator two hours, three times daily. In all night except fifteen minutes for nursing care every two hours during night."
   b. If signs of breathing difficulty develop, the patient must be returned to the respirator immediately.
7) Vital capacity readings, for obvious reasons, are done only when indicated on the acutely ill patient whose vital capacity is known to be less than 200 cc.
   a. When the patient begins to breathe independently of the respirator, these readings will be done once or twice daily as indicated.
   b. When the patient spends considerable time—several hours—out of the respirator daily, vital capacity tests are done twice weekly.
8) Positive pressure, when used concurrently with the intra-tank negative pressure, is discontinued when the patient is well stabilized and without complications.

   A determination of the optimum negative pressure setting for maintenance of the tidal volume is made before the positive pressure is discontinued. Positive pressure then may be used if needed for nursing care.

SUMMARY

A method of evaluating the breathing capacity of the poliomyelitis patient has been described. Technics and signs in the management of the poliomyelitis patient have been discussed. Careful observation of and meticulous attention to safeguards for the patient become paramount as an assistive measure to the physician in planning for individual needs of patients. Cooperation and coordination of services by professional personnel concerned with the care of the poliomyelitis patient with respiratory difficulties becomes a necessity.

BIBLIOGRAPHY

1. Bower, A. G., Bennett, V. R., Dillon, J. B. and Axelrod, B.: Investigation on the care and treatment of poliomyelitis patients. Annals of West. Med., 4:10-12 (Oct.-Nov.) 1950.
2. Austin, E., Dail, C. W., Bower, A. G., and Ackley, R.: Present concepts in the management of the poliomyelitis patient with respiratory difficulty. In press. Phys. Thpy. Rev.
3. Cohen, M. E.: Quoted in Swank, R. L., and Smedal, M. I.: Pulmonary atelectasis in stuporous states; a study of its incidence and mechanism in sodium amytal narcosis. Am. J. Med. 5:210, 1948.
4. Best, C. H. and Taylor, N. B.: The physiological basis of medical practice. Williams & Wilkins, Baltimore 1950 Ed. 5 pp. 344 et seq.

Gait Training in Poliomyelitis

Duane A. Schram, M.D., Aline Bletcher, B.A., and Carmella Gonnella, M.S.

WILL I EVER WALK AGAIN?

This inevitable question of the poliomyelitis patient will normally not be answered so simply as "yes" or "no," but resolves itself to a consideration of whether only crude ambulation or a graceful, rhythmical gait with adequate stability and protection will result. To attain the desired gait it is necessary to have the full cooperation of the patient, plus a well qualified professional staff to carry out the treatment program. The program is a lengthy one that consists of logical, progressive step-by-step activities. The early preparation for gait should be as carefully planned and carried out as the details of the ultimate functional activity.

Preparation

Progressive Resistance Exercises:

After coordination has been well established through a detailed program of muscle reeducation, the next logical step is to concentrate on exercises which will increase the strength and endurance of those muscle groups that are of primary importance in walking. These units are the body elevators, hip hikers, and the weight-bearing groups of the lower extremities. The most efficient method to strengthen neuromuscular units is undoubtedly the technic now known as Progressive Resistive Exercises (P.R.E.). If a pool is available, under-water resistance exercises are an excellent method to supplement the conventional technics of P.R.E. using weights and balances. The under-water exercises are most efficient with those muscle groups that have less than "fair" strength (nonfunctional). For muscle groups having "fair" to better strength (functional), heavy resistance technic is undoubtedly the method of choice. An example of the preference of methods would be P.R.E. to the gastroc-soleus group. The under-water P.R.E. technic for this group can be controlled by using graduated steps to vary the water level, but when the unit becomes functional it can be more effectively strengthened in the standing position using weights, or on the Elgin table (Figure 1). The same stated methods can be used to strengthen the hip hikers of the trunk (quadrati and lateral abdominals) (See Figures 2 and 3). Similarly, if the body elevators of the upper extremities are functional, heavy resistance technic can be effected in the standing position between parallel bars, or if the strength is less than "fair," the exercise can be carried out in water (See Figures 4 and 5).

Figure 1. Resistance P.R.E. technic to the right gastroc-soleus group.

Mobilization:

To utilize all the strength of which subnormal muscle units are capable, we must be certain the units are not working at a disadvantage because of faulty alignment. Any tightness or contractures causing malalignment may be mobilized by various methods. The severity of the technic used in mobilization is in direct proportion to the degree of tightness. A mild contracture may well respond to manual manipulation, while an old, severe contracture will usually require surgical assistance. If a contracture is of moderate tightness, mobiliza-

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Figure 2. Patient taking P.R.E. to the hip hikers on the right using weights.

tion generally can be carried out successfully by traction methods. An example would be the application of traction to tight hip flexors by use of a Bradford frame. The pelvis is held and splinted with a corset and bilateral long leg braces with a cross bar between the inner uprights. The angle of the frame and the length of time spent in traction is increased as rapidly as the soft tissue and the patient's personality permits. The patient may be in traction from 1 to 20 hours daily; in the free hours he continues with other therapy and available activities (Figure 6).

Apparatus:

In anticipation of early walking reeducation, it is important that the physician makes adequate prescription for apparatus and later checks the accuracy of the fitting. Ill fitting equipment not only handicaps a patient but actually may predispose to deformity. Apparatus is indicated where need for support, assistance, and protection is evident. Some of the usual equipment used in gait training is as follows:

Corset: If there has been adequate preparation, a back brace and/or pelvic band is not indicated. A custom-fitted corset with rigid posterior stays gives the patient adequate support and permits freedom of movement necessary in walking and in other remedial activities.

Braces: The basic requirement of a leg brace, whether long or short, is an accurate fit. Of secondary consideration is the utilization of light weight metals, special type of locks, hinges and leather work. As previously suggested, the indications for braces are a need for assistance and protection. An example of this need occurs with an isolated weakness of the gastroc-soleus group in a child. A long leg brace with a free hinge at the knee is fitted with an elastic band attached to the midthigh band above and to the heel of the shoe below. The band will assist the weak gastroc-soleus group in "pushing off" and the midthigh band will prevent the knee from going into hyperextension should the child have a tendency toward recurvatum.

Another example of protection and assistance is in the use of a twister in correcting external rotation in the child. An adult who has had adequate mobilization and preparation usually presents no problem in rotator balance, but it is found that many children need the added encouragement of a twister. This device is made of heavy elastic webbing that is attached to an abdominal binder above and circled around the leg to the outside of the sole of the shoe below. Tension on this twister causes the leg to be rotated inwardly; as the child learns to control and balance his rotators, the ten-

Figure 3. Under-water P.R.E. technic to the left hip hikers. As the strength and endurance increase the level of the water is lowered by graduating to the higher step.

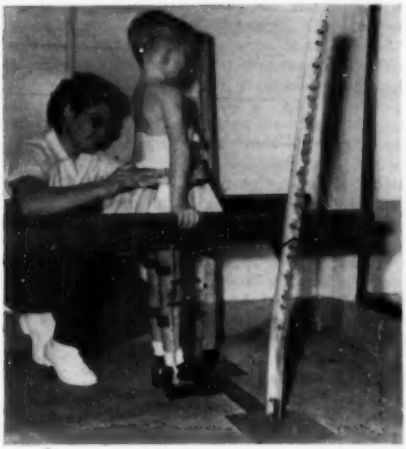

Figure 4. P.R.E. to body elevators in standing position and between parallel bars. Pockets in front and behind on apron carry the weights.

Figure 5. Non-functional body elevator on a P.R.E. exercise program using the buoyancy of the water. Seat on exercise table is adjustable.

sion of the elastic can gradually be lessened until he is able to walk correctly without it.

Crutches and Canes: It should be emphasized that in teaching a gait to a patient wearing braces, the use of crutches or canes is necessary for stability, assistance and protection. There are various types of crutches and canes, each of which is prescribed to meet the need of the individual. Axillary crutches are usually indicated for those individuals with severe trunk and lower extremity weakness. Because of the high axillary attachment, there is maximum support provided for this extensive weakness. This type of crutch is also useful for the patient with poor balance whose future activity will occasionally require freedom of the arms. An Everett crutch with arm bands above and below the elbow will render greater stability. This added stability coupled with the elimination of the possibility of exerting excess pressure on the axilla, makes this type of crutch preferable in most cases.

As the patient gains more strength and/or balance, he may be able to graduate to canes. This equipment permits greater freedom but should not be prescribed at the expense of adequate stability, assistance and protection. The conventional cane, with hand grip only, is seldom utilized but the cane with a forearm band with or without an angled offset is commonly used. The cane with the offset, incidentally, gives excellent assistance in the "push off" for a weak calf muscle.

FUNCTIONAL TRAINING

After a patient has been on a P.R.E. program for a variable length of time, it will be found that the rate of progress in return of strength gradually diminishes. It is then that early gait training should be considered. Mobilization procedures can be continued in this stage of the program if indicated, and also P.R.E. exercise if there is adequate control over the functional training activities, especially during the early period when initial balancing exercises are the primary objective.

Balance:

The basic requirement of any functional activity, and especially gait, is adequate balance. Acquiring a gait is a matter of developing sufficient coordinated strength to alter position, and then locomotion is accomplished by first losing and then regaining balance. In the early stage of training, it is essential to start with the simplest maneuver and then graduate to the more difficult only

Figure 6. Patient is shown in hip traction on a Bradford frame. The cross bar between braces splints one leg to the other. Corset is fitted to exert pressure over anterior superior spine in front to prevent pelvis from rotating.

after the less complicated activity is mastered. The moderate to severely involved patient may be required to initiate balancing exercises in the sitting position on the mat before an attempt is made to stand between parallel bars. The mild to moderate case can usually begin in the upright position between bars. When standing and balancing in parallel bars it is preferred that the height and width between handrails be the same as that between hand grips if the patient were on crutches. It is also suggested that when the patient is attempting to accommodate for his weakness in the upright position, he practice in front of a mirror so he can see as well as feel what he is doing. The amount of time spent in this activity will depend upon the patient's residual strength, innate ability to coordinate, age, and his determination to walk.

Fundamental Crutch Gait:

The fundamental gait pattern is learned in the parallel bars and the type or types of gait taught will be those most practical for the individual case. These fundamental gait patterns are described briefly below:

Four Point Gait: Although this gait is one of the slowest, it is a safe one because three points are in contact with the floor at one time. One crutch is advanced followed by the opposite foot, then the other crutch forward followed by the other foot. The body weight is repeatedly shifted from side to side.

Two Point Gait: This gait is much faster than the one above and requires greater strength and coordination. There are two points of support at any one time. One crutch and the foot opposite lead and are placed down on the floor simultaneously; this is followed by the other crutch and the other foot.

Three Point Gait: This gait applies to those who have one nonfunctional leg only, the other one is capable of supporting the body weight. Both crutches are used to support the weak part, while the functional leg is alternately swung and bears weight without aid of crutches.

Tripod Gait: This is a gait for the severely involved who have a minimum of stability in the upright position. One crutch at a time or both simultaneously are placed in front of the patient and the feet are then dragged along the floor. If this is repeated fast the patient will rock backwards and forwards on his crutches as his feet are jerked ahead.

Swing Gait: In this gait, both crutches are moved forward and placed in contact with the floor at the same time. The arms then lift and suspend the body between the crutches to drop the feet either behind or in front of the crutches. The latter or swing-through gait requires excessive strength in the upper extremities, good coordination, and the necessary confidence.

After the pattern or patterns are mastered in parallel bars similar training is repeated, using crutches or canes. The emphasis is on mastering a smooth, rhythmic gait, even if for a few steps at a time. Endurance will be an objective only after these fundamental patterns have become essentially automatic.

Exceptional Gaits:

Although the above gaits can be used with most patients, there is an occasional case in which improvisations are necessary. If there is not sufficient power in the upper extremities to adequately compensate for loss of strength in the trunk and lower extremities, it will be inevitable that some degree of sacrifice of stability and protection must be made for ambulation. The patient with flail arms will be forced to use his available strength in the trunk and lower extremities to ambulate. If the legs are severely involved, walking will not be possible but if there is a moderate spotty strength, walking may be practical. Even then, in the standing position he will have a tendency to develop contracture and deformity because of the lack of

protection, and the practicability of walking will be in direct proportion to the degree of stability. Another type is the severely involved person with enough strength in one or both upper extremities to offer minimum support, and who has been fitted with a corset and long leg braces. Repeated attempts at walking find him with insufficient strength to take steps unaided. By the removal of one leg brace (some isolated "poor" strength needed especially in hip flexors) the patient may be able to ambulate. In this example a brace is retained for stability while the other is discarded to effect mobility.

CONCLUSION

A basic program for gait training in poliomyelitis has been outlined. The various phases of this program are but logical progressive steps toward the ultimate goal of function. The capacity of this function and the grace with which it is accomplished will depend directly upon the skill of the professional staff and the native coordination and cooperation of the patient.

Intensive Exercises in Early Poliomyelitis

A. David Gurewitsch, M.D., and Paul Philip Proud, M.A.

Active exercises carried out by the patient are the most important measure at our disposal to build up muscle strength. It has been found that the exercise volume must be as high as possible to obtain the optimum recovery of muscle function. Kabat has proven this for multiple sclerosis and other diseases of the upper motor neuron, and DeLorme and Watkins have developed a technic of heavy resistance exercises which has been used successfully in a great variety of diseases. This technic has been applied to advantage also in the chronic stage of poliomyelitis (Krusen, Mead).

Because in the early stages of poliomyelitis the application of active exercises meets with a number of difficulties, the patient is usually given inadequate muscle reeducation. We have tried to develop a method which can be adjusted to meet these difficulties as well as increase the exercise volume. This presentation is devoted to a description of this method, its advantages and limitations.

Any exercise program in the acute phase of poliomyelitis will depend on many factors including the patient's general state of health, his ability to breathe and swallow, and his need for rest. In addition, we encounter specific difficulties which interfere with active exercises including tightness which prevents a full range of motion, and pain on movement or at rest. Incoordination may interfere with the training of a weak muscle and fatigue may develop quickly in severely involved muscles after very few contractions. The patient's understanding of what we would like him to do is often very limited, depending on his age, his intelligence, and his kinaesthetic sense. To these specific difficulties are added others of an administrative kind. Most hospitals have at their disposal a limited number of trained physical therapists, allowing usually only one treatment session each day in a five-day week. Into this one session a considerable amount of treatment has to be crowded. Beside active exercises, muscles and joints have to be stretched, and accurate coordination has to be observed. A considerable amount of this time is allocated to stretching and coordination exercises.

For our program, exercises are selected which the patient can carry out by himself or with as little assistance as possible. They consist of simple movements aimed at training only one muscle or muscle group. The starting positions will depend on the available muscle strength and on the extent of the involvement of other muscles. The range of motion should be no greater than pain or tightness permit. The extremity is put into a position that corresponds to the testing position of the Lovett system. This is accomplished with the help of slanting plywood boards or with slings suspended from a Balkan frame, aided or resisted by weights and pulleys. The exercise must be easy enough for the patient to perform accurately several times, but difficult enough to exhaust the patient's available strength within a limited number of repetitions.

The patient is carefully instructed to carry out the exercise as accurately as possible within a given range at a given rhythm, and is told to repeat the exercise until he observes the first sign of diminishing accuracy. We call this beginning of diminishing output the fatigue point. Each ex-

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ercise is to be practiced to the fatigue point. We build up each exercise to a maximum repetition of twenty-five times, at which point the position is changed and a new exercise introduced which allows for only two to four repetitions.

Each patient has his own exercise equipment within reach but changes to new positions. Adjustments of weights, pulleys and angles are done by the physical therapist, who makes his rounds with a wheeled tray containing a supply of weights, pulleys, sandbags, slings, string, buckshot, simple tools, and plywood boards of various sizes.

The patient carries out the prescribed exercises as often as is compatible with rest periods, with his general state of health, with hospital routine such as meals, rounds, and other treatments. On the whole, we find it possible to have the patient perform six to eight daily sessions but due to general fatigue this number of exercise periods may have to be reduced. We find that we can train intensively at one time approximately six muscles, and we select the muscles to be trained in order of their functional importance. All the other involved muscles are given daily reeducational exercises by the physical therapist.

The patient is given an exercise sheet for each exercise (See Figure 1) the top of which is filled out by the physical therapist. It describes the exercise and its purpose and any change of the exercise is recorded with the dates when the change has been made. The lower part of this form is filled out by the patient after each exercise, when he records the number of repetitions he was able to accomplish until the fatigue point was reached. The patient also adds up the total number of repetitions for the day. We have found that such a chart serves many purposes as it demonstrates to the patient objectively his continued gradual progress and also indicates to us whether the exercise is well designed. If there is no quick progress there is usually something wrong with the exercise. The specific exercise may not be well devised as the patient may be over-zealous, thus overstepping the fatigue point, or he may be lazy and never reach it, or the intensity of the exercise may be beyond the level of the patient's general strength.

The illustrations, Figures 2-19 show a few examples of these exercises. Figures 2-5 show the gradual build-up of anterior abdominal muscles. The patient starts out leaning against the maximally elevated gatch in his bed, accomplishing just the last few degrees of motion up to the vertical position. Gradually the gatch is lowered, so that the exercise becomes progressively more strenuous. We determine the exact position of the gatch by numbers of turns, counting from the

EXERCISE SHEET

Name — Patient E. H. Unit 27

Muscle practice to be exercised: Right Hamstrings Date of Rx: Sept 1950

Muscles exercised and position, knots, etc.: Initial check: P

On right side, powder board under right leg horizontal. Left leg flexed.

Date	Exercise
9/22/50	Flex right lower leg on board.
9/26/50	Remove board.
9/27/50	On board against 30° angle.

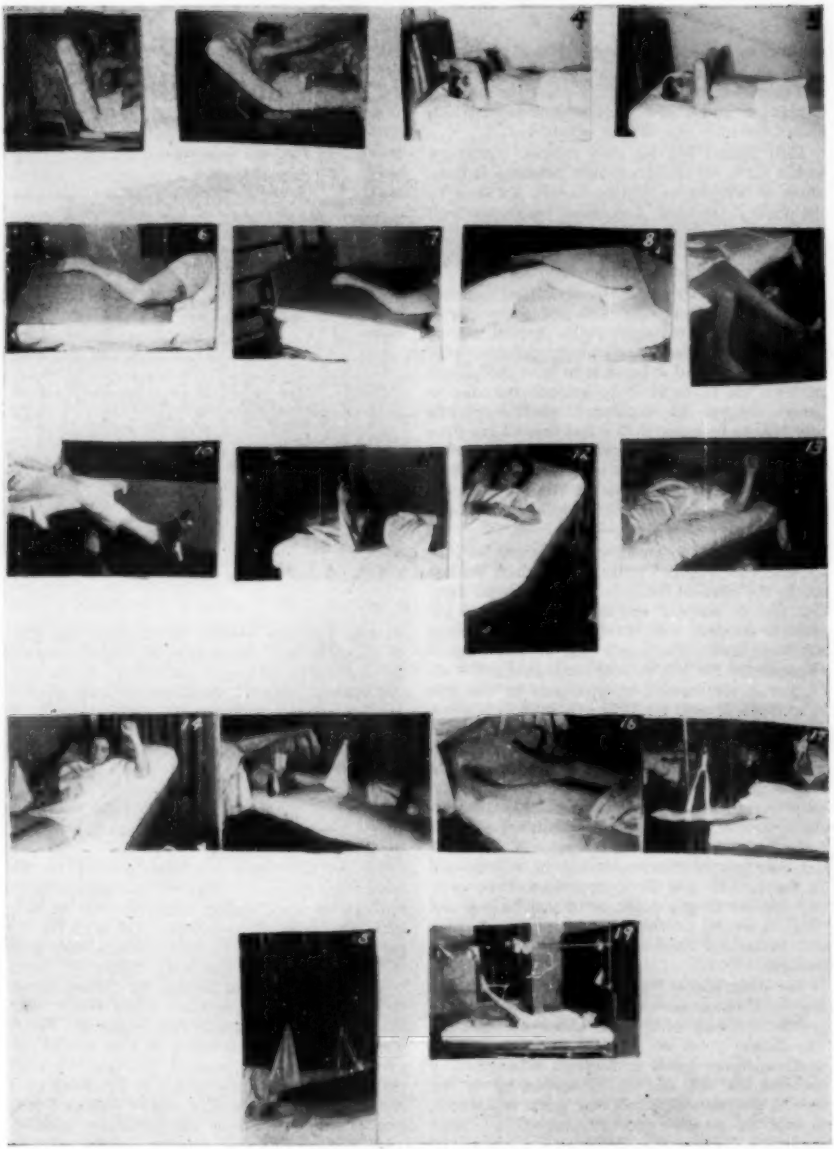
Date									Total	Muscle check
9/22/50	13	14	14	13	15	14	14		97	P
16	14	15	14	15	15	15	14		102	
17	16	15	15	14	16	15	14		105	
18	17	16	16	15	18	17	16		115	
19	18	20	19	20	18	19	18		132	
9/26/50	3	3	2	4	3	4	3		22	P
21	3	5	6	4	5	4	5		32	
22	5	6	5	7	8	6	6		43	
23	4	5	5	7	7	6	6		40	
24	5	6	7	6	9	7	8		48	
25	7	9	10	9	8	8	9		60	P+
26	8	10	10	11	10	10	11		70	
27	9	11	11	12	10	9	10		72	
28	10	11	10	13	12	11	12		79	
29	11	13	11	16	13	14	13		87	
30	15	14	14	13	15	14	15		100	
9/1/50	16	15	15	14	17	16	15		108	
9/2/50	2	2	3	2	1	2	2		14	P+

Figure 1

starting position. We do not decrease the angle of the gatch until the number of flexions are built up to 25 times. When the patient can do the exercise starting from the horizontal position, providing his upper extremities are strong enough, he is ready for the next stage, that of swinging toward a sitting position with a weight in his hands (See Figure 4). Later, this weight can be decreased gradually until the patient can swing without any weight. Finally, he should be able to sit up from a lying position without the help of his arms (See Figure 5).

Figures 6-10 show a similar build-up for the quadriceps muscle. In Figure 6 the patient is extending his knee, sliding downhill with the help of a powdered plywood board. The angle of the powdered board will be decreased gradually until it reaches the horizontal (See Figure 7). Later on, the tilt is reversed so that the motion has to take place uphill against the tilted board, with gradually increasing angles (See Figure 8). Figure 9 shows the patient extending his knee against full gravity in the sitting position. In Figure 10 additional weight has been added in the form of a weighted shoe. The weight will be increased with further improvement of the quadriceps muscles.

A similar scale of increased effort may be planned for the build-up of any other muscle.



Figures 2-19

An extremity to be exercised may be completely suspended so that motion can take place without any friction. Figure 11 demonstrates this in trace muscles. The pictures 12-14, which are self-explanatory, show examples of stages in the build-up of a deltoid muscle. Figure 14 is inserted here to show some pitfalls we have to guard against—it demonstrates too rapid increase of a work load. The abduction is performed incompletely while the patient is also elevating her shoulder. Figures 15 and 16 show exercises for hip adduction at a trace, poor minus and poor level of muscle strength. Figure 17 shows an exercise for the lower trapezius muscle. This position is maintained from trace to fair level with the weight, which assists in elevating the arm, being gradually decreased. The arrangement shown in Figure 18 can be used for training knee flexion, knee extension, hip flexion and hip extension, at trace or poor minus levels. Figure 19 shows the adaption for the training of hip flexion in an otherwise totally paralyzed extremity.

The method presented has certain limitations and advantages. There is no question in our minds that the most preferable method of muscle reeducation in the early phases of poliomyelitis is one which is supervised by a trained physical therapist many times throughout the day. For any hospital, this proposition appears utopian. It can be accomplished, or nearly accomplished, by an intelligent mother who is free of most other household duties and who has been trained to treat her child at home. The mother can be taught to understand the particular problem of her child and to assist in carrying out the active motion designed by a supervising physical therapist, who visits the home at regular and frequent intervals. At the hospital, this method cannot be applied to young children because they are not cooperative enough and they cannot be made to understand the principle of these exercises. Our youngest patient was ten years old. This represents a considerable limitation as a large group of patients with poliomyelitis are younger than ten.

We have not been able to devise appropriate exercises for all muscles nor for all stages of weakness of a given muscle because all active unsupervised exercises, however carefully guarded, are apt to encourage substitution. We have not seen any serious harm resulting from substitution; however, if substitution does occur, we redesign the particular exercise.

The psychological factor is one of the most important advantages of this method over the routine we employed previously. The moment the patient starts working along the described lines he no longer lies passively in bed hoping and waiting for treatments to be given him. He realizes that his improvement will depend on his active participation rather than on outside factors which he cannot control, and he becomes fully occupied. We no longer have to worry that time will weigh heavily on the patient's hands, with possible depressive implications. We observed that the spirit of the polio ward changed markedly after instituting this new routine, with everybody being busy "on his homework."

Patients may be discharged sooner. Once an intelligent patient understands the principle of our approach to muscle reeducation and the criteria for adjusting and changing his exercises, he can go home after his general symptoms of pain, tightness, and threatening deformities have been controlled. He may continue his exercises under the supervision of a physical therapist who visits him at periodic intervals.

All other factors being equal, a patient with strong motivation toward recovery will get on his feet faster than a patient lacking such motivation. The method presented considerably improves the impulse toward recovery. By keeping his own record the patient constantly is made aware of his daily progress and of his contribution to such progress.

The muscles which have been subjected to the described exercise method have improved faster than could have been expected from what we knew of these muscles before using this method, and from what we had learned in general experience.

SUMMARY

A technic of intensive active exercises for use in the early stages of poliomyelitis has been presented. It is intended to be practiced by the patient himself, six to eight times daily, and requires a minimum amount of equipment. The exercise dosage can be controlled by fatigue levels which can be objectively defined. Examples of exercises have been illustrated. It is felt that this exercise technic results in increased muscle strength, in a considerable shortening of hospitalization, in an improvement of the patient's morale, and in a speeding-up of the tedious process of recovery from poliomyelitis.

BIBLIOGRAPHY

1. Kabat, H.: New Principles of Neuromuscular Reeducation. Permanente Foundation Medical Bulletin, Vol. 5, No. 3; Nov. 1947.
2. DeLorme, T. L. and Watkins, A. L.: Techniques of Progressive Resistance Exercises, Archives of Physical Medicine, p. 263; May, 1948.
3. Krusen, E. M. Jr.: Functional Improvement Produced by Resistive Exercise of Quadriceps Muscles Affected by Poliomyelitis. Archives of Physical Medicine, p. 271; May, 1949.
4. Mead, S.: Intermittent Treatment of Poliomyelitis with Progressive Resistance Exercise. American Medical Association, p. 438; Oct., 1950.
5. Gurewitsch, A. D.: Intensive Graduated Exercises in Early Infantile Paralysis. Archives of Physical Medicine, pp. 213-218; April, 1950.

Improvised Equipment for Hydrotherapy

Merton E. Miller, Ed.B., and Marion B. Stewart, B.S.

The problem of providing adequate hydrotherapy for patients with poliomyelitis frequently arises in institutions without facilities for therapeutic pool therapy. The problem is compounded when the patient load becomes so great that it is impossible to provide treatment in the Hubbard tub for all the patients who need it. Some means must then be devised for stepping up the rate of treatment without, at the same time, cutting down on the time each individual remains in the water.

We have overcome these difficulties in the Physical Therapy Department of Charity Hospital of Louisiana at New Orleans by the use of three small stretchers in the Hubbard tub, one placed at each side of the head and the third placed at the foot (See Figure 1). Each stretcher is made of standard canvas laced to ½" pipe which is 20" wide at the top and bottom, and 40" long at the sides. At the head of the stretcher is a hook-like apparatus, resembling the standard-holder made by the Ille Electric Company, by means of which the stretcher is hooked onto the lip of the tub (See Figure 2). At the foot is a riser of special design which elevates the stretcher from the floor of the tub (See Figure 2). Stretcher, hook, and riser are made in separate pieces, each of which is so light as to be readily manageable. The metal parts of this apparatus were made in the machine shop at the hospital and the canvas was prepared in the hospital sewing room.

The possibility of cross infection naturally arises when children with an infectious disease are placed in water at the same time. To guard against it when this apparatus is used three administrative regulations have been formulated:

1. Only children who have had poliomyelitis are put in the tub together, and this treatment is not used until the acute stage of the disease is past.
2. Children with colds, skin rashes, or any other condition considered communicable are not placed in the tub with well children.
3. The tub is drained and cleaned after each group of children has occupied it, which means that the water is always clean. Actually, there is no difference between placing children together in this tub, which is in effect a pool, and allowing

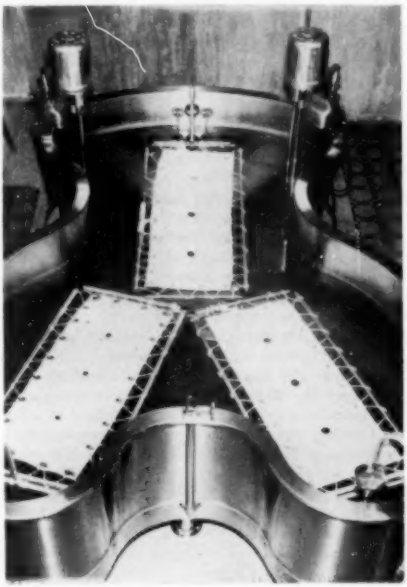


Figure 1

Figure 2

Merton E. Miller, Supervisor, Poliomyelitis Unit, Physical Therapy Department, Charity Hospital of Louisiana, New Orleans, La.
Marion B. Stewart, Technical Director, Physical Therapy Department, Charity Hospital of Louisiana, New Orleans, La.

them to be together in a therapeutic pool, which is standard practice.

In actual use this form of hydrotherapy has been found to have a number of advantages: The equipment is inexpensive and can be fashioned easily in any hospital workroom. The capacity of the Hubbard tub is tripled, while there is no reduction of the amount of time each patient spends in the water. The use of the stretchers brings the patients much closer to the edge of the tub and thus reduces the strain on the physical therapist working with them. Also, the patients are more easily managed because they are closer to the edge. Smaller children are less apt to be apprehensive and frightened when they are treated in the company of other children. Finally, since the equipment is removable, one, two, or three patients can be treated at a time, according to the needs of the physical therapy schedule.

The necessity for the careful selection of patients to be treated by this method can scarcely be listed as a disadvantage. On the other hand, it must be admitted that it is sometimes more difficult to obtain the child's full attention and cooperation when he is distracted by other children.

SUMMARY

Equipment has been described which can be improvised in hospital workrooms and which can be used in the Hubbard tub for treating one, two, or three children at the same time. Its advantages and possible disadvantages have been enumerated.

*Suggestions from the Field**

Temporary Equipment for Acute Poliomyelitis Patients

Dorothy Spark

In the care of poliomyelitis patients, it is often necessary to devise for them temporary equipment to protect and preserve the neuromuscular fibers which remain intact.

Handroll:

Purpose: (1) Prevent flexor contracture of the hand.
(2) Protect the opponens and extensor digitorum longus and brevis.

Equipment necessary:
(1) Sponge rubber or cotton.
(2) Pieces of gauze or muslin.
(3) Adhesive tape (optional).

Procedure:
(1) Use sufficient sponge rubber to make the desired size.
(2) Cover with muslin for cleanliness.
(3) Hold the thumb and fingers in place by passing a 1" strip of muslin or adhesive longitudinally over the roll.

Shoe Pickup

Purpose: (1) To prevent over-stretching of weak dorsal flexors of the foot in early ambulation, if a permanent brace is not thought to be necessary.
(2) To start the patient on gait training while waiting for his drop foot brace.

Equipment:
(1) Ace bandage.
(2) Two (2) safety pins.

Figure 1

*Physical therapists who have developed or adapted equipment to meet individual patient needs are encouraged to share their ideas through the *Physical Therapy Review*.

Physical Therapist, Crile Veterans Administration Hospital, Cleveland, Ohio.

Figure 2

(3) Flat tin to fit the shoe.
(4) Inner tube bands (two or as many as is necessary).

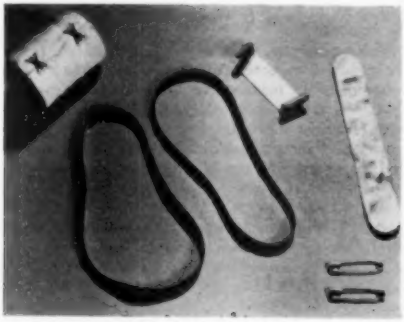


Figure 3

Procedure:

(1) Cut tin to fit the sole of shoe—bend around the sole of the shoe and back making a hook.
(2) Wrap bandage around the leg snugly.
(3) Place inner tube bands in tin hooks and bring up to the Ace bandage and pin. Note: You may place bands many different ways to get the desired tension.

Polio Pledge

If Polio Comes to My Community

I Will Remember to

Let my children continue to play and be with their usual companions. They have already been exposed to whatever polio virus may be in that group, and they may have developed immunity (protection) against it.

Teach my children to scrub their hands before putting food in their mouths. Polio virus may be carried into the body through the mouth.

See that my children never use anybody else's towels, wash cloths or dirty drinking glasses, dishes and tableware. Polio virus could be carried from these things to other people.

Follow my doctor's advice about nose and throat operations, inoculations, or teeth extractions during the polio season.

Be ever watchful for signs of polio: headache, fever, sore throat, upset stomach, tenderness and stiffness of the neck and back.

Call my doctor at once and, in the meantime, put to bed and away from others any member of my family showing such symptoms.

I Will Not

Allow my children to mingle with strangers, especially in crowds, or go into homes outside their own circle. There are three different viruses that cause polio. My children's group may be immune to one of these. Strangers may carry another polio virus to which they are not immune.

Let my children become fatigued or chilled. Overtired or chilled bodies are less able to fight off polio.

Take my children away from our community without good cause. Polio time is the time to stay at home and keep with everyday companions.

If Polio Strikes My Home

I Will

Have confidence in my doctor, knowing the earlier the care the better my child's chances for complete recovery.

(Continued on page 378)

Procedures for the Recruitment of Physical Therapists for Poliomyelitis Care

Adopted by the American Physical Therapy Association (APTA) and the National Foundation for Infantile Paralysis (NFIP) on April 1, 1952 for recruitment within the United States.

The following Procedures for the Recruitment of Physical Therapists apply when NFIP chapters are expected to participate in payment of salaries of physical therapists needed for poliomyelitis patients. Consultant service will be made available by APTA.*

The NFIP and APTA desire to assist in seeing that all of the hospital's polio patients receive adequate physical therapy service. However, every effort must be made to assure the most effective use of physical therapy personnel.

Recruitment service for physical therapists for temporary work with polio patients will be given by the APTA upon the written request of the administrator of the hospital and approval of the NFIP state representative.

This recruitment service is available in times of emergency caused by the incidence of poliomyelitis. It is applicable to acute and immediate post-acute care and not to long-term or convalescent-type care.

I. Recruitment

A. The need for temporary assignment of physical therapists must be determined by the hospital administrator in consultation with the NFIP state representative.

B. The hospital desiring to employ physical therapists will be expected first to utilize available or transferable personnel within the community.

If the hospital expects the NFIP chapter to underwrite any portion of a physical therapist's salary, the APTA must be notified on application form, PRS-2, of the names and assignment dates of all physical therapists recruited.

C. If the staff cannot be augmented as described, the administrator of the hospital may submit the application form, PRS-2, to the NFIP state representative for approval. This will then be forwarded to the APTA, Polio Recruitment Service, 1790 Broadway, New York 19, N. Y. Copies of this form may be secured from the state representative or the APTA.

D. All requests under "C" will be given consideration but before a physical therapist is recruited, the hospital requesting assistance will be expected to supply written evidence of the need.

The APTA, to assure an equitable distribution of personnel throughout the country, will evaluate evidence submitted and other data available to them. This, it is recognized, may then result in delay or denial of some requests because of the problem of supply and demand to be met.

II. Qualifications

A. Physical therapists with one or more of the following qualifications will be referred to temporary positions:

1. A graduate of a physical therapy school approved by the Council on Medical Education and Hospitals of the American Medical Association.
2. A member of the APTA.
3. A senior member of the American Registry of Physical Therapists (ARPT).

III. Employment and Personnel Policies

A. Physical therapists recruited by the APTA become employees of the hospital to which they are assigned. NEITHER THE NATIONAL FOUNDATION NOR THE AMERICAN PHYSICAL THERAPY ASSOCIATION IS THE EMPLOYER OF THESE PHYSICAL THERAPISTS. It is the responsibility of the hospital to orient physical therapists to the hospital program.

Since these physical therapists will be employed by the hospital, it is expected that the privileges of sick leave and state workmen's compensation, if extended to the professional staff employed regularly by that institution, will be extended to recruited physical therapists.

Recruited physical therapists are considered temporary employees and are not entitled to vacations with pay.

B. *Length of temporary service:*

Physical therapists recruited from outside the assignment community agree to serve for a minimum period of three months, though they may be released at an earlier date, if no longer needed.

*These Procedures cover service to agencies as well as to hospitals. Wherever the word "hospital" is used, the word "agency" may be substituted.

Requests for extension of the temporary assignment period must be supported by written evidence of continuing need. This data must be filed with the NFIP state representative for approval and forwarded to the APTA for evaluation and possible extension of the assignment. The application form need not be used.

The total period of temporary service may not exceed six months.

NOTE: The NFIP will not underwrite the cost of return transportation unless an official extension has been granted.

C. *Hours of work:*

The physical therapist shall work the regular institutional hours of the hospital to which he or she is assigned. Not less than forty hours and not more than forty-eight hours of duty per week is considered a reasonable work week.

D. *Salaries:*

Recruitment salaries have been determined by NFIP in consultation with APTA. They are:

1. $250.00 per month for new graduates.
2. $285.00 per month for physical therapists after one year's experience.
3. $300.00 per month for physical therapists with additional preparation and experience.
4. Physical therapists recruited locally for part-time work may be paid a pro-rated salary, based on the above classifications.

The APTA will make decisions on an individual basis as to which of the above salaries should be paid to any recruited physical therapist.

Payment of salary should be made by the hospital in accordance with the regular pay period for professional staff in that hospital. The physical therapist's salary shall start at the time of reporting on duty, but, in any event, not later than twenty-four hours after reporting her arrival to the hospital.

Physical therapists recruited for a three-month period, who are released by the hospital prior to the completion of assignment, shall receive one week's notice or one week's salary. However, physical therapists leaving assignments of their own accord prior to completion of three months' service, shall be paid through the last day of service.

The hospital shall pay its established starting salary to any recruited physical therapist. If such personnel are not regularly employed, the administrator and the state representative, with the advice of the APTA, shall arrive at a rate to be paid by the hospital which is consistent with practice in the area. NFIP chapters will reimburse the hospital for the difference between its salary payment and the full recruited salary. If the hospital is unable to pay any of these additional costs, the state representative may authorize a chapter to pay the entire salary for that physical therapy service required in excess of the work load of the regular employees.

NFIP chapters will not reimburse hospitals for any portion of physical therapists' salaries unless physical therapists have been processed through the application and assignment procedure, as outlined herein.

NFIP chapters should not pay for out-patient treatments given by physical therapists for whom the NFIP is underwriting the salaries.

E. *Withholding tax, Social Security and insurance:*

Federal income tax on salary and maintenance of recruited physical therapists, as for other hospital employees, will be withheld by the hospital according to government regulations. At the termination of employment, the hospital will furnish withholding tax statements to recruited physical therapists.

Social Security coverage is subject to the policy in practice in the hospital, and to government regulations. Any questions regarding Social Security should be referred to the hospital administration.

The NFIP has insurance coverage for recruited physical therapists who contract polio. This insurance covers medical and hospital expenses, within limits, as well as a weekly indemnity for a specified period.

The hospital is expected to notify NFIP, Medical Services Division, 120 Broadway, New York 5, N. Y., upon the admission and diagnosis of poliomyelitis of any such personnel.

F. *Maintenance:*

1. Physical therapists recruited outside the community should receive maintenance to include lodging, meals, and laundry of uniforms at the hospital, if at all possible.

   The NFIP chapters are authorized to reimburse the hospital for the actual cost of such maintenance, but not to exceed $100.00 per month.
2. When maintenance is not available at the hospital to physical therapists recruited outside the community, an allowance up to $100.00 per month to be applied toward maintenance will be paid to each physical therapist by the hospital as partial compensation for living away from home.

   NFIP chapters are authorized to reimburse the hospital for this monthly maintenance allowance.

   When living accommodations for physical

therapists are not available in the hospital, accommodations in the community should be arranged for them in advance by the hospital, and the NFIP chapter should be assured that these arrangements have been made.

3. In those instances where lodging is available at the hospital but the physical therapist chooses to live outside, it may be done, provided the physical therapist assumes the responsibility of finding the accommodations. The physical therapist will be paid up to $100.00 per month stipend by the hospital, minus the cost of any meals or laundry furnished by the hospital. NFIP chapters are authorized to reimburse the hospital for this monthly maintenance allowance.
4. Physical therapists recruited to serve in their own community by the APTA, or one of its component chapters, will pay for any meals or laundry received at the hospital, unless the hospital wishes to furnish such services without charge.

IV. Supervision

A. *Medical:*

All physical therapy must be prescribed by a physician. No physical therapist will be recruited unless medical direction is assured.

B. *Physical Therapy:*

Recent graduates or physical therapists with no experience in the care of polio patients will be referred only to facilities where qualified physical therapy supervision is available.

If the hospital cannot provide a qualified physical therapy supervisor, the APTA will assist in obtaining a physical therapist with supervisory experience and ability for the assignment.

Qualified physical therapists may not work under the supervision of an unqualified physical therapist.

V. Travel Expense

A. Travel expense from place of recruitment to place of assignment will be advanced by the APTA. Return travel expense to place of recruitment or equitable amount applying to other location will be paid unless the physical therapist—

1. Leaves of own accord prior to termination date of assignment.
2. Leaves assignment for vacation, holiday, or any unauthorized leave.
3. Remains beyond termination date of assignment without authorization of the APTA.

B. Such travel expense is to include: Cost of plane, bus, or train (including Pullman) accommodations, plus an allowance of $10.00 per day (24 hours) while traveling, in lieu of salary and expenses such as meals en route, taxis, tips, baggage costs, and purchase of travel insurance by the physical therapist. In addition, the cost of lodging, if necessary, between planes, buses, or trains, not to exceed $5.00 per day, will be allowed.

C. If physical therapists travel to their assignments by car, the APTA will pay expenses at the rate of 7c per mile. (This should not exceed expenses for travel by plane or train, whichever is greater.) When traveling by car, the allowance of $10.00 per day will be allowed only for the same number of days necessary to reach destination by train. Expenses for additional time, because of preference of travel, are to be absorbed by the physical therapist.

D. Travel expense, as outlined, shall be reimbursed by NFIP headquarters office to APTA.

Annual dues were payable on May 1st. Your prompt response will be appreciated.

May we also call to your attention that according to the Bylaws "any active member not actively employed in physical therapy may, on application to the Executive Committee and on approval thereof by the Committee, be made an inactive member."

Guiding Principles for Adapted Physical Education*

Prepared by the AAHPER Committee on Adapted Physical Education and endorsed by the AAHPER Board of Directors and the Joint Committee on Health Problems in Education of the American Medical Association and the National Education Association.†

It is the responsibility of the school to contribute to the fullest possible development of the potentialities of each individual entrusted to its care. This is a basic tenet of our democratic faith.

1. There is need for common understanding regarding the nature of adapted physical education.

Adapted physical education is a diversified program of developmental activities, games, sports, and rhythms, suited to the interests, capacities and limitations of students with disabilities who may not safely or successfully engage in unrestricted participation in the vigorous activities of the general physical education program.

2. There is need for adapted physical education in schools and colleges.

According to the best estimates there are about four million children of school age in the United States with physical handicaps. Only 11 per cent of this group requiring special educational services are receiving them through special schools and classes.‡ The vast majority of exceptional children are attending regular schools.

The major disabling conditions, each affecting thousands of children, are cerebral palsy, poliomyelitis, epilepsy, tuberculosis, traumatic injuries, neurological problems, and heart disease. Further evidence indicates that on the college level there is a significant percentage of students requiring special consideration for either temporary or permanent disabilities.

3. Adapted physical education has much to offer the individual who faces the combined problem of seeking an education and living most effectively with a handicap.

Through adapted physical education the individual can: (a) Be observed and referred when the need for medical or other services are suspected; (b) Be guided in avoidance of situations which would aggravate the condition or subject him to unnecessary risks or injury; (c) Improve neuromuscular skills, general strength and endurance following convalescence from acute illness or injury; (d) Be provided with opportunities for improved psychological adjustment and social development.

4. The direct and related services essential for the proper conduct of adapted physical education should be available to our schools.

These services should include: (a) Adequate and periodic health examination; (b) Classification for physical education based on the health examination and other pertinent tests and observations; (c) Guidance of individuals needing special consideration with respect to physical activity, general health practices, recreational pursuits, vocational planning, psychological adjustment, and social development; (d) Arrangement of appropriate adapted physical education programs; (e) Evaluation and recording of progress through observations, appropriate measurements and consultations; (f) Integrated relationships with other school personnel, medical and its auxiliary services, and the family to assure continuous guidance and supervisory services; (g) Cumulative records for each individual, which should be transferred from school to school.

5. It is essential that adequate medical guidance be available for teachers of adapted physical education.

The possibility of serious pathology requires that programs of adapted physical education should not be attempted without the diagnosis, written recommendation, and supervision of a physician. The planned program of activities must be predicated upon medical findings and accomplished by competent teachers working with medical supervision and guidance. There should be an effective referral service between physicians, physical educators, and parents aimed at proper safeguards and maximum student benefits. School administrators, alert to the special needs of handicapped children, should make every effort to provide adequate staff and facilities necessary for a program of adapted physical education.

6. Teachers of adapted education have a great responsibility as well as an unusual opportunity.

Physical educators engaged in teaching adapted physical education should: (a) Have adequate professional education to implement the recommendations provided by medical personnel; (b) Be motivated by the highest ideals with respect to the importance of total student development and satisfactory human relationships; (c) Develop the

*Reprinted from the April 1952 issue of *The Journal of the American Association for Health, Physical Education, and Recreation.*

†This statement is prepared for general use in schools and colleges rather than in special schools for handicapped children.

‡U. S. Office of Education, "Statistics of Special Schools and Classes for Exceptional Children," *Biennial Survey of Education in the United States, 1946-48.* Washington, Supt. of Documents, U. S. Government Printing Office, 1950, p. 3.

ability to establish rapport with students who may exhibit social maladjustment as a result of a disability; (d) Be aware of a student's attitude toward his disability; (e) Be objective in relationships with students; (f) Be prepared to give the time and effort necessary to help a student overcome a difficulty; (g) Consider as strictly confidential information related to personal problems of the student; (h) Stress similarities rather than deviations, and abilities instead of disabilities.

7. Adapted physical education is necessary at all school levels.

The student with a disability faces the dual problem of overcoming a handicap and acquiring an education which will enable him to take his place in society as a respected citizen. Failure to assist a student with his problems may retard the growth and development process.

Offering adapted physical education in the elementary grades, and continuing through the secondary school and college, will assist the individual to improve function and make adequate psychological and social adjustments. It will be a factor in his attaining maximum growth and development within the limits of the disability. It will minimize attitudes of defeat and fears of insecurity. It will help him face the future with confidence.

The Committee on Adapted Physical Education

1. Louis R. Burnett, M.D., chief, Physical Medicine Rehabilitation Service, Veterans Administration, Dayton, Ohio.
2. Arthur S. Daniels, Ph.D., professor of physical education, Ohio State University.
3. Arthur K. Flanagan, Ph.D., director of administrative services, Society for Crippled Children and Adults, Inc.
4. Edward D. Greenwood, M.D., Menninger Clinic.
5. Frances A. Hellebrandt, M.D., director, Department of Physical Medicine and Rehabilitation, Research and Educational Hospitals, University of Illinois.
6. Ivalclare Howland, Ed.D., State Teachers College, Cortland, New York.
7. Valerie Hunt, Ph.D., Department of Physical Education for Women, University of California, Los Angeles.
8. Romain P. Mackie, Ph.D., specialist, Schools for the Physically Handicapped, Office of Education, Federal Security Agency.
9. Cecil W. Morgan, Ph.D., Lieutenant-Colonel, MSC, 371st Convalescent Center, Fort Lewis, Washington.
10. Eugene J. Taylor, *New York Times*.
11. Catherine Worthingham, Ph.D., National Foundation for Infantile Paralysis.
12. H. Harrison Clarke, Ed.D., *Chairman*, Director of Graduate Studies, Springfield College.

Index to Current Literature

Anterior Poliomyelitis

The Positive-Pressure Respirator Dome: This Device Is a Useful Adjunct to the Care of Some Patients with Poliomyelitis. A. J. Steigman, M.D., and P. H. Rumph. American Journal of Nursing, March 1952.

Cerebral Palsy

Who Am I? (A Victim of Cerebral Palsy). F. J. Herglotz. Survey, March 1952.

Geriatrics

Realism in the Rehabilitation of the Aged and Chronically Diseased with Regard to Public Health. H. A. Kemp, M.D. Southern Medical Journal, March 1952.

Manipulation

Case Illustrating Hazards of Manipulative Treatment in Lumbosacral Disk Protrusions. Robert Hafner. British Medical Journal, February 16, 1952.

Miscellaneous

Portfolio on Hospital Planning. Modern Hospital, March 1952. The Modern Hospital of the Month, R. W. Cutler; Tuberculosis Unit, C. M. Knox and P. N. Jensen; Neuropsychiatric Unit, George Blumenauer; Ceiling-hung Tube Expediates X-ray Service; Convalescent Unit, A. B. Mills; Rehabilitation Unit, H. W. Kendell, M.D.; The Modern Hospital of the Year, 1951—Hospital Construction Trends, L. S. Reed; The Question Is Never the Same, Roger Allen.

Iowa's Program for Crippled Children. Raymond R. Rembolt, M.D., Journal of Iowa State Medical Society, April 1952.

The Costobrachial Syndrome. Josephus C. Luke, M.D. Canadian Medical Association Journal, February 1952.

The Consultation Process in Public Health Nursing. E. C. Gilbertson, R.N., and E. M. Willson, R.N. Public Health Nursing, March 1952.

The Visiting Nurse Service of New York Is Cost Conscious. Mabel Reid. Public Health Nursing, March 1952.

Nervous and Mental Diseases and Injuries

Emotional Problems of Physically Handicapped Adolescents—A Study of Ten Adolescent Boys. Joseph Levi and Barbara Michelson. Exceptional Children, April 1952.

"Trigger Thumb" Simulating Paralysis: Report of 2 Cases. Andrew Zinovieff. British Medical Journal, January 26, 1952.

Peripheral Vascular Diseases

Occlusive Arterial Disease of the Extremities. Samuel Lisker, M.D. Pennsylvania Medical Journal, March 1952.

Rehabilitation

World-wide Interest in Education of the Handicapped. Romaine Mackie, Ph.D. School Life, February 1952.

Have You Read These?

Recent Publications on Poliomyelitis

American Journal of Hygiene

Bodian, D. "Experimental Studies on Passive Immunization Against Poliomyelitis. 1. Protection with Human Gamma Globulin Against Intramuscular Inoculation and Combined Passive and Active Immunization." July 1951, p. 132.

Anderson, Gaylord W., Anderson, G., Skaar, H., and Sandler, F., "Poliomyelitis in Pregnancy." January 1952, p. 127.

American Journal Physical Medicine

Bouman, H. D., "Electrical Stimulation of Respiration." February 1952, p. 40.

American Journal Public Health

Sabin, A. B., "Paralytic Consequences of Poliomyelitis Infection in Different Parts of the World and in Different Population Groups." October 1951, p. 1215.

Archives of Physical Medicine

Routh, J. I., and Paul, W. D., "Electrophoretic Studies of Plasma and Serum Proteins in Anterior Poliomyelitis." June 1951, p. 397.

Harrell, A., Mueller, E. E., and Mead, S., "Electrically Heated Hot Packs: Experimental Study of a New Method." April 1951, p. 211.

Schram, D., and Bennett, R. L., "Underwater Resistance Exercises." April 1951, p. 222.

Sweeney, F. X., and Stoner, E. K., "Hot Packing." April 1951, p. 206.

Blau, Leslie, Phillips, Joseph, and Rose, Donald L., "A Device to Facilitate Standing From a Sitting Position: For Patients with Severe Residuals of Poliomyelitis." March 1952, p. 159.

Journal of the American Medical Association

Albrecht, R. M., and Locke, F. B., "Effects of Physical Activity on Prognosis of Poliomyelitis." June 30, 1951, p. 767.

Brahdy, M. B., and Katz, S. H., "Effects of Transportation on Severity of Acute Poliomyelitis." June 30, 1951, p. 772.

Plum, F., and Wolff, H. C., "Observations on Acute Poliomyelitis Respiratory Insufficiency." June 2, 1951, p. 442.

Lowman, Charles L., "Acceleration of Convalescent Care of Poliomyelitis Patients." July 21, 1951, p. 1097.

Watkins, Arthur L., "Practical Application of Progressive Resistance Exercises." February 9, 1952, p. 443.

Journal Bone and Joint Surgery

Werner, A. V., Zumeta, G. R., Newman, R. W., and Hines, H. M., "Comparison of Vital Capacity in Normal and Poliomyelitis Subjects." July 1951, p. 628.

Irwin, C. E., and Eyler, D. L., "Surgical Rehabilitation of the Hand and Forearm Disabled by Poliomyelitis." October 1951, p. 825.

Bunnell, S., "Restoring Flexion to the Paralytic Elbow." 1951, p. 566.

Journal National Medical Association

Worthingham, C., "Professional Education and Poliomyelitis." 1951, p. 23.

Physical Therapy Review

Dawe, Sidney M., "Paralysis of the Masseter and Temporal Muscles." December 1951, p. 512.

Harrington, Paul R., "Standing Bed in Poliomyelitis." January 1952, p. 12.

Dobbin, Helen M., "The Standing Bed in Physical Therapy." January 1952, p. 14.

Reference Made to Utah Research Studies

The Journal of the American Medical Association carried an editorial on Immunization Against Poliomyelitis in the May 17, 1952 issue. The reference to the studies initiated in Utah during 1951 are significant to our Association. Miriam Jacobs, on a leave of absence from the D. T. Watson School of Physiatrics, was the physical therapist serving on the research team under the direction of Dr. William McD. Hammon, Department of Epidemiology and Microbiology of the University of Pittsburgh, Graduate School of Public Health in Pittsburgh, Pennsylvania.

POLIO PLEDGE *(Continued from page 372)*

I know that my child has a better than even chance to recover without paralysis.

Call my local chapter of the National Foundation for Infantile Paralysis immediately for information or help. The telephone book or my health department will tell me how to reach the chapter.

Remember that whatever financial help my family needs for polio care will be given through the chapter. This is made possible by the gifts of the American people to the March of Dimes each January.

Reprints Available

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A list of schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

SUGGESTIONS FOR PROSPECTIVE STUDENTS—
Outlines the professional course of study for college students preparing for physical therapy. Of value to the high school student who is planning a college program.

EMPLOYMENT OPPORTUNITIES—
A brief analysis of the various types of employment opportunities open to the graduate physical therapist.

QUESTIONS AND ANSWERS—
A concise outline describing physical therapy education and applications.

Available to chapter chairmen, vocational guidance counsellors, libraries and other individuals or groups who wish more information on physical therapy than is offered in the above items:

OUR ASSOCIATION—
An informational booklet on the activities, scope and services of the American Physical Therapy Association.

CODE OF ETHICS—
Ethics for the physical therapist of the American Physical Therapy Association.

PERSONNEL POLICIES FOR QUALIFIED PHYSICAL THERAPISTS—
Suggestions as to salary, hours, vacations etc. by the American Physical Therapy Association.

INFORMATIONAL BRIEFS ON SCHOOLS OF PHYSICAL THERAPY—
Admission requirements, costs of education and pertinent information on all approved schools.

SECTION ON EDUCATION—
A list of postgraduate programs offered by the approved schools and a list of specialized courses for physical therapists.

RECRUITMENT POSTER—
Attractive, colorful, throw-away bulletin board poster to help vocational guidance and recruiting.

JOB OF THE PHYSICAL THERAPIST—
A complete description of what the physical therapist does, where he works and how he functions in the professional field as well as what type of individual he is. (Single copies are free to counsellors, libraries and chapters; additional single copies 50c each, 10-25 copies 35c each, 25 or more copies 25c each.)

U. S. ARMY, U. S. AIR FORCE AND VETERANS ADMINISTRATION PAMPHLETS—
Separate folders listing education, employment or service opportunities in each organization.

MEMBERS, STUDENT MEMBERS OF THE ASSOCIATION AND LIBRARIES MAY HAVE ONE FREE COPY OF EACH SCIENTIFIC REPRINT FOR WHICH THERE IS A CHARGE EXCEPT THE SPECIAL ISSUES OF THE REVIEW AND OTHER SPECIAL MATERIALS FOR WHICH A FEE MUST BE CHARGED:

Scientific Reprints

PHYSICAL THERAPY IN MEDICAL DISEASES OF THE CHEST—*Evelyn A. May* (10c)

PHYSICAL THERAPY IN THE EARLY CARE OF COLD INJURIES—*Mary E. Sacksteder, Capt., WMSC* (10c)

TOYS, GAMES AND APPARATUS FOR CHILDREN WITH CEREBRAL PALSY—*Gladys G. Rogers and Leah Thomas* (10c)

ADMINISTRATION OF A COMMUNITY REHABILITATION CENTER—*Hazel E. Furscott* (10c)

WHEEL CHAIRS—*George G. Deaver, M.D.* (5c)

PHYSICAL THERAPY IN THE PRENATAL PROGRAM—*Gillian Griffith Smith* (5c)

ROLE OF PHYSICAL THERAPY IN CARE OF PSYCHIATRIC PATIENTS—*Lola E. Smith* (5c)

(Continued on page 385)

Editorials

THE POLIO RECRUITMENT SERVICE of the American Physical Therapy Association, functioning under a grant from the National Foundation for Infantile Paralysis, is preparing its forces for emergency services which may be required during the coming season. In anticipating future needs, we benefit by reviewing and evaluating past experiences.

Between May 1, 1951 and April 30, 1952, sixty-three temporary assignments of recruited physical therapists were made to thirty-five hospitals and agencies in twenty states that were experiencing an increase in a polio patient load. On May 1, 1952, all but six recruited physical therapists had been released from their temporary assignments.

We have had four consecutive years of the worst polio epidemics in history and they have made heavy demands on the resources for assistance, both in personnel and funds. Some of the figures for these years are significant to physical therapists.

Calendar Year	*1948*	*1949*	*1950*	*1951*
Polio Patients Reported	27,902	42,375	33,351	28,668
Physical Therapists Recruited	255	148	118	71
Facilities Served	83	91	71	39
States Served	25	27	23	21

In analyzing many of the areas, in relation to these figures, certain trends are noted. A better distribution of physical therapists is apparent in some parts of the country. In 1951, only two physical therapists were recruited into hospitals that had no physical therapy service. More facilities had increased their permanent staff of physical therapists and were ready for an emergency situation. Some communities have organized their services to provide a sharing of professional personnel in time of need. Pre-planning for polio emergency situations has brought unification of effort in the identification of certain hospitals as primary centers for the early care of the polio patient; it has resulted in the establishment of other facilities for the care of the patient with complications, and the acceptance by public health agencies of the responsibility for a follow-up program.

There has been a realization that the family is a part of the treatment team and, because of this, earlier discharge from the hospital has been possible for a selected number of patients. The physical therapist has taught a responsible member of the family some of the necessary care which must be continued in the home between visits to the physician's office, hospital, outpatient department, or treatment center. During the 1951 season, seven physical therapists were requested and recruited to assist in developing home care programs in several states. These physical therapists, in cooperation with other community agencies, extended the hospital services to the home by means of family instruction in the home or treatment center.

The polio patient requiring the assistance of a respirator is presenting complex problems. Three articles in this issue of the *Review* represent part of a program which was developed by the Southern California chapter of the American Physical Therapy Association to meet the requests of its members for this information. We, as physical therapists, are beginning to understand our contribution and the need for cooperation in the management of the polio patient in the respirator.

During the spring period, the Polio Recruitment Service carries on a survey program and compiles information regarding physical therapists available for temporary polio assignments. The revised *Procedures for the Recruitment of Physical Therapists for Poliomyelitis Care* appear on page 373. You may be a recruited physical therapist or may need a recruited physical therapist during the coming season. A careful reading of the procedures may be important to you.

The polio consultants have visited physical therapy services of hospitals or agencies in seventy-four communities of eighteen states. High priority was given to the communities where recruited physical therapists had been requested and assigned, and where special projects and programs were being planned or given. They stand ready to help you if you have problems in 1952.

Association Activities

The Director Reports:

I am particularly proud of this issue of the *Review* which has been prepared under the guidance of the consultants in poliomyelitis, Lucy Blair and Ruth Whittemore.

The increased number of patients requiring the respirator makes it mandatory that physical therapists have more information about their care. The material in this issue should be of invaluable help, and provide better understanding and care for the respirator patient.

Each year, as we approach the polio season, we hope that this year will be a light year; however, we try to prepare, in so far as we can, for any emergency. It is obvious, that most important is sufficient personnel, wise use of personnel, and equitable distribution.

I hope that all of you who are available for polio epidemic service in your home area or where needed, will respond to the call promptly. Recruitment is for a real need and cannot be put off a week or two or until it is convenient. The patient is waiting.

On the job, work should be well planned. Nonprofessional help can be used for clerical and housekeeping duties and for some assistance with the patient, otherwise these activities can use up to 30 per cent of the therapist's work day or, on an eight hour day, two hours and forty minutes.

The National Office consultants are here to help you. During an epidemic period, field visits are scheduled to the various areas where the need for consultant service is greatest. Others may write to them and keep them informed of any staffing problems. They will support you in your efforts to provide and maintain maximum use of your professional knowledge and skill.

Your help, cooperation, and suggestions will be deeply appreciated by the Association, the National Foundation for Infantile Paralysis, and most of all, by the patients who need you.

—MILDRED ELSON
Executive Director

Letter of Appreciation

Dear Miss Elson:

I want to thank you personally and on behalf of the National Foundation for the splendid work you, your associates and the American Physical Therapy Association have done in recruiting physical therapists for poliomyelitis patients during 1951 and for the contribution your organization has made toward the improvement of the physical therapy profession in general.

I am aware of the tremendous energy and work involved in planning and carrying forward the program necessary to assure adequate care to all patients. Our field staff and chapters have been most complimentary about the work of the American Physical Therapy Association.

My very best wishes.

Sincerely,

BASIL O'CONNOR, *President*
The National Foundation
for Infantile Paralysis

Membership News

Marriages

Ruth Nygren of Los Angeles, Calif., now Mrs. Ruth N. Ackley, Los Angeles, Calif.
Alice Taber of Acushnet, Mass., now Mrs. Alice T. Bailey, Acushnet, Mass.
Audrey D. Hardy of Gloversville, N. Y., now Mrs. Audrey H. Baird, Johnstown, N. Y.
Margaret Shellestad of Milton, Wis., now Mrs. Margaret S. Baker, Washington, N. C.
Roberta Donaldson of Elmhurst, Ill., now Mrs. Roberta D. Bley, Lombard, Ill.
Jane Feigert of Los Alamos, New Mexico, now Mrs. Jane F. Bolger, Berkeley, Calif.
Dolores Pucine of Ithaca, N. Y., now Mrs. Dolores P. Borys, Ithaca, N. Y.
Marilyn L. Croxford of Los Angeles, Calif., now Mrs. Marilyn C. Crutcher, Glendale, Calif.
Ann Porter of Brookline, Mass., now Mrs. Ann P. Egan, Brookline, Mass.
Edna Foster of Chicago, Ill., now Mrs. Edna F. Elam, Hines, Ill.
Aleatha Jones of Westfield, N. J., now Mrs. Aleatha J. Fahringer, Dallas, Pa.
Janet Harvey of Fitchburg, Mass., now Mrs. Janet H. Fickett, Fitchburg, Mass.
Josephine Hobbley of Detroit, Mich., now Mrs. Josephine H. Finch, Detroit, Mich.
Elise M. Dunlop of Bayshore, L. I., N. Y., now Mrs. Elise D. Fish, Whitestone, N. Y.
Jean Murray of La Jolla, Calif., now Mrs. Jean M. Good, San Diego, Calif.
Dolores I. Guldjard of Seattle, Wash., now Mrs. Dolores G. Hoavig, Seattle, Wash.
Mrs. Mary S. Justen of Toledo, Ohio, now Mrs. Mary S. Homlar, Toledo, Ohio
Evelyn Nelson of Brooklyn, N. Y., now Mrs. Evelyn N. Isken, New Castle, Del.
Barbara Ann Jensen of Longmeadow, Mass., now Mrs. Barbara J. Jennings, Longmeadow, Mass.
Cecelia Rubnitz of West Allis, Wis., to Alfred Katz, M.D., Los Angeles, Calif.
Mary Lieberman of Latrobe, Pa., now Mrs. Mary L. MacQueen, Pittsburgh, Pa.
Jeanne E. Hastings of Baltimore, Md., now Mrs. Jeanne H. Maljanian, Baltimore, Md.
Ruth Davison of East Orange, N. J., now Mrs. Ruth D. Marvinney, East Orange, N. J.
Hilda F. Zakel of New Castle, Pa., now Mrs. Hilda Z. McKethan, San Benito, Tex.
Amy Marie Salisbury of Bend, Ore., now Mrs. Amy S. Mildram, Flushing, N. Y.
Mae G. Scott of Los Angeles, Calif., now Mrs. Mae S. Mossman, Santa Ana, Calif.
Evelyn Wood of Arlington, Va., now Mrs. Evelyn W. Nestor, Arlington, Va.
Laura Becklund of Minneapolis, Minn., now Mrs. Laura B. Plank, Minneapolis, Minn.
Nancy A. Lewis of Norwich, Conn., now Mrs. Nancy L. Snorski, Norwich, Conn.
Marcia Kaufman of New Haven, Conn., now Mrs. Marcia K. Terese, New Haven, Conn.
Diana Griffith of Toronto, Canada, now Mrs. Diana G. Tisdall, Toronto, Canada
Louise Estergreen of Indianapolis, Ind., now Mrs. Louise E. Watts, Indianapolis, Ind.

New Student Members

Boston University

Mary Louise Anderson	Ann Hinman
Janet L. Frye	Harriet E. Glazer

St. Louis University

Florence B. Klausing	Sister Mary Ellen Lawley
	Sister M. Jeanette

Stanford University

Barbara Adams	Walter L. McCarrell
Suzanne Bemis	Erika K. Reimer
Mary Jo Cook	Caroline S. Resch
Helen A. Hanson	Shirley Anne Scotten
Shirley L. Hornbeck	Melba L. Thomas
Thomas L. Humphrey	Owen P. Thomas
Shanna Lee Jones	Beth Ussher
Ronald E. Kamb	Nancy White
Elaine Luhdorff	Raymond R. Wiseman

"Polio Pledge" Widely Distributed

To provide the homes of America with the latest medically-approved precautions against polio, the National Foundation for Infantile Paralysis is distributing 35,000,000 copies of its 1952 "Polio Pledge" for parents. *(See Page 372.)*

Assisting the March of Dimes organization in reaching as many homes as possible are the nation's schools, men's and women's organizations, labor unions, churches, business and industrial firms, newspapers, and radio and television stations.

United States Commissioner of Education Earl James McGrath has urged widespread distribution of the "Pledge" through the schools, declaring:

"How to prevent polio is still unknown, but more and more facts about the disease are being uncovered yearly. In case polio comes, intelligent action based on reliable information is of vital importance. Teachers play a leading role in bringing this knowledge to youngsters and their parents—to help them understand."

The National Foundation has issued a Spanish language version of the "Pledge" for dissemination in Puerto Rico and those areas of the United States containing large numbers of Spanish-speaking people.

Schools of Physical Therapy

For "Approved Schools of Physical Therapy," please refer to the June issue of the *Physical Therapy Review*. The list will appear in the August journal.

Chapter Activities

State representatives of the National Foundation for Infantile Paralysis have a working manual which includes the names and addresses of all presidents of chapters of the American Physical Therapy Association. Thirty-four of our chapters have a representative member serving on a local or state Polio Planning Committee.

The following chapters have reported on activities in meeting personnel needs or participation in an educational program in relation to the care of the poliomyelitis patient:

Northern California
Santa Barbara
Southern California
Colorado
District of Columbia
Florida
Illinois
Iowa
Kentucky
Maine
Maryland
Massachusetts
Minnesota
Eastern Missouri
Nebraska
New Hampshire
Central New York
New York
Western New York
North Carolina
Ohio
Western Pennsylvania
South Carolina
South Dakota
Tennessee
Texas
Utah

They are to be congratulated!

General News

Physical Therapy—United States Navy

The Bureau of Naval Personnel has announced that applications are being accepted from qualified women physical therapists between the ages of 21 and 30 for appointment as commissioned officers in the Medical Service Corps, USN and USNR.

Professional qualifications for appointment as Ensign are a Baccalaureate degree from an accredited college or university with the major in physical education or the biological sciences, or to be a graduate of a school of nursing, and have completed a physical therapy training course in one of the schools for physical therapists accredited by the Council on Medical Education and Hospitals of the American Medical Association. Selected candidates with a Ph.D. or D.Sc. degree will be appointed in the grade of Lieutenant (junior grade).

Selected candidates will be given a professional examination designed to test their knowledge of the basic science in their field and to determine their academic knowledge.

Further information and applications may be obtained from the Office of Naval Officer Procurement in the following cities: Albany, N. Y.; Albuquerque, Boston, Buffalo, Butte, Chicago, Cincinnati, Dallas, Denver, Detroit, Houston, Kansas City, Mo., Los Angeles, Macon, Ga., Minneapolis, Nashville, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Raleigh, Salt Lake City, San Francisco, Seattle, St. Louis, and Washington, D. C.

The Daniel Institute of Prosthetic Service Offers Courses

The Daniel Institute of Prosthetic Service is announcing a five-week course in prosthetic service for graduate physical therapists beginning July 1, August 15, October 1, and November 15, 1952. Mr. Earle H. Daniel, Director, was formerly with the New York University-Bellevue Institute of Physical Medicine and Rehabilitation, where he lectured to students of the Rehabilitation Course.

Mr. Daniel has a vast background of experience in the design, manufacture and fitting of prostheses. He has established this Institute to aid amputees and paralytics, and the courses are planned to provide qualified physical therapists with additional information regarding limb prescriptions and fitting. The courses also will include actual shop practice, and textbooks will be furnished.

The Institute will assist those who take the course in finding living quarters. Further details may be found in an advertisement appearing elsewhere in this issue of the *Physical Therapy Review*.

The American Congress of Physical Medicine Plans Thirtieth Session

The 30th annual scientific and clinical session of the American Congress of Physical Medicine will be held on August 25, 26, 27, 28 and 29, 1952 inclusive, at The Roosevelt Hotel, New York, N. Y. Scientific and clinical sessions will be given on the days of August 25, 26, 27, 28 and 29. All sessions will be open to members of the medical profession in good standing with the American Medical Association. In addition to the

scientific sessions, annual instruction seminars will be held. These lectures will be open to physicians as well as to therapists, who are registered with the American Registry of Physical Therapists or the American Occupational Therapy Association. Full information may be obtained by writing to the American Congress of Physical Medicine, 30 North Michigan Avenue, Chicago 2, Illinois.

Commission on Financing of Hospital Care Outlines Two-Year Study

The fact finding phase of the two-year national study by the Commission on Financing of Hospital Care was launched when the Commission at its meeting in Washington, April 19, approved detailed proposals relating to emphasis, organization, and method of its research program.

The Commission, an independent organization of 34 members financed by $500,000 in grants from foundations, elected to devote a major portion of its budget and staff resources to intensive study of the following basic problems:

1. Evaluation of the current financial position of hospitals and a determination of hospital cost elements and the factors that affect these elements, including identification of cost and methods of financing medical research and professional education;
2. Physician-hospital relationships and varying patterns of medical practice as they affect the cost of hospital care;
3. Financing of hospital care for the non-wage, low income, rural, and chronic illness groups;
4. Problems associated with voluntary prepayment of hospital care, including methods for determining amounts of payments to hospitals by prepayment and other agencies buying care.

The Commission based its study program on the recommendations of its technical advisory committee and on a nation-wide sample of opinion on the most urgent economic problems faced by hospitals and the purchasers of hospital care.

Since its first meeting on November 29 of last year, the Commission has sponsored a number of conferences with representatives of both professional and public groups to obtain these opinions and to determine what information was most needed in developing solutions to hospital financing problems.

The Commission on Financing of Hospital Care was initiated by the American Hospital Association "to study the costs of providing adequate hospital services and to determine the best systems of payment for such services." It is, however, an independent agency which will make its report directly to the American public.

The Commission also will study methods for coordinating community hospital facilities, improving administrative methods in hospital operation, financing hospital care for the chronically ill, and determining economic limitations in expansion of hospital services.

Special committees composed of Commission members are being established to advise on the development of research projects for each of the basic studies. The Commission is appointing advisory committees of experts in the fields of statistics, prepayment, fiscal studies, and effects of varying patterns of medical practice on hospital costs. Consultants on problems of chronic illness, community organization, industrial management and economics are being engaged.

The Commission plans to study intensively hospital financing problems in a group of selected communities which are to be chosen in view of such factors as the extent of local cooperation and local financing that can be obtained and the availability of study material. These community studies will encompass all major problems being studied by the Commission.

A comprehensive state-wide study of hospital financing problems now being conducted under Commission sponsorship in North Carolina is being coordinated with the national studies.

The Commission is now making a careful survey of all research now being conducted in the field of hospital care financing so that its fact finding projects will not duplicate or overlap the projects of other agencies.

Graham L. Davis, a past president of the American Hospital Association now on leave of absence from the W. K. Kellogg Foundation, is study director. Associate director is Harry Becker, formerly social security director of the UAW-CIO, and medical director is Dr. Donald J. Caseley, now on leave of absence from his position as medical director of the Indiana University Medical Center.

Coming Meetings

The American Occupational Therapy Association will hold its annual convention at the Hotel Schroeder in Milwaukee, Wisconsin, on August 9-16, 1952.

REPRINTS AVAILABLE *(Continued from page 379)*

METHODS OF CLINICAL INSTRUCTION IN PHYSICAL THERAPY—*Beatrice E. Whitcomb, Capt., WMSC* (10c)

PHYSICAL THERAPY IN THE HOME—*Arthur L. Watkins, M.D.* (5c)

PHYSICAL THERAPY IN STATE CRIPPLED CHILDREN'S PROGRAM—*Clara M. Arrington* (5c)

THE USE OF LEAD-UP FUNCTIONAL EXERCISES TO SUPPLEMENT MAT WORK—*Morton Hoberman, M.D., Erbert F. Cicenia, Hyman L. Dervitz and Oscar C. Sampson* (10c)

THE REHABILITATION OF APHASICS—*Dorothy Britton* (10c)

Special Materials

BIBLIOGRAPHY ON NATURAL CHILDBIRTH (10c)

READING REFERENCES FOR ELECTRICAL DIAGNOSIS AND ELECTRICAL STIMULATION (10c)

FILM LIST OF SPECIAL INTEREST TO PHYSICAL THERAPISTS AND STUDENT PHYSICAL THERAPISTS

These films may be secured on rental, loan or sale depending on the course. Unless otherwise specified, all films are believed to be 16 mm. (15c)

POLIO ISSUE OF THE *Review* (JULY 1951)—

Contains eight articles by leading physicians and physical therapists. There are thirty-one abstracts from current medical journals. (50c)

CEREBRAL PALSY ISSUE OF THE *Review* (FEBRUARY 1952)—

Contains six articles by outstanding experts in the field of cerebral palsy. (50c)

PHYSIOLOGY OF THE HEART AND CIRCULATION AND ITS CLINICAL APPLICATION IN PHYSICAL MEDICINE—

A bound edition of the papers presented in a symposium at the 1950 annual conference of the American Physical Therapy Association with introduction by Harry D. Bouman, M.D., Coordinator. ($1.00)

ESSENTIALS OF A HOSPITAL DEPARTMENT—PHYSICAL THERAPY—

This manual is designed to supply broad guidance in planning, installing, equipping and administering a physical therapy department in a hospital. Compiled by experts in many fields and published by the American Hospital Association. (To members 25c)

PLAN AND SPECIFICATIONS FOR AN ALL-WELDED STEEL TREATMENT POOL (No charge)

ORGANIZATIONAL GUIDE FOR SCHOOLS OF PHYSICAL THERAPY—

Gives a broad interpretation of the essentials of a physical therapy school as established by the Council on Medical Education and Hospitals of the American Medical Association. (No charge)

Special Polio Issue of the *Review*

This issue of the *Physical Therapy Review*, which includes timely and informative articles on the treatment of the poliomyelitis patient with emphasis on his care in the respirator, is available at special rates on quantity orders. Single copies of the July 1952 journal are 75c per copy; in orders of 10 to 50 it will be 50c; 50 to 100, 35c; 100 or more, 25c each. There are special rates for students in approved schools of physical therapy.

All requests should be addressed to American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.

Abstracts

"Glossopharyngeal Breathing" by Paralyzed Patients: A Preliminary Report

Clarence W. Dail, M.D., Los Angeles. In CALIFORNIA MEDICINE, 75: 3:217, September 1951.

An unusual kind of respiratory action is practiced by several patients at the Rancho Los Amigos who have pronounced poliomyelitic impairment of the respiratory muscles and who, except by this kind of breathing, have a very low vital capacity and limited ability to breathe without artificial means.

Very similar to the lung breathing used by most amphibia including frogs and toads, it consists of trapping a small amount of air in the mouth and throat and then forcing it through the larynx by action of the tongue and pharynx and sometimes of the cheeks. The air is then held in the lungs by closure of the larynx while the mouth and pharynx are again filled with air, which again is forced into the lungs. This is repeated about a dozen times until the lungs are quite filled. The air in the lungs is then emptied, usually through the partly closed lips. This is repeated continuously with a respiratory rate of about six per minute. The terms "glossopharyngeal breathing" and "frog breathing" seem to be quite appropriate for brief description.

Several of the patients discovered this method of breathing without help or even suggestion that it was possible. Others learned from them. Several of the patients who breathe in this manner are able now to be out of the respirator for several hours.

Adequate strength of the participating muscles, those of the larynx, pharynx, soft palate, tongue and cheeks and mouth, is of course necessary. Care should be taken that this method of breathing is not overdone in the presence of inadequacy. There should be no undue fatigue which may lead to anoxia. To permit time for practice, artificial respiration should be stopped several times daily, for not more than a minute at a time at first but for gradually extended periods as the patient improves in technic. The volume of ventilation per minute should be measured before the patient is able to breathe more than about ten minutes.

Prescription of Physical Therapy in Poliomyelitis

Sedgwick Mead, M.D., St. Louis. In JOURNAL OF THE MISSOURI STATE MEDICAL ASSOCIATION, 49:3:215, March 1952.

There are three main requirements for intelligent physical treatment in poliomyelitis: (1) an understanding of the pathological process and of the physiologic effects of physical agents, (2) competent technical personnel and (3) adequate equipment, which may be modest and frequently improvised.

As long as there is any fever or evidence of increasing weakness, one must enforce almost complete bed rest. During this phase the physical therapist carries out passive motions of the trunk and all extremities through a complete range of motion. Using care to prevent sagging or undue tension on tender parts, he does each movement at least ten times and preferably repeats each visit twice daily. The most important motions are trunk flexion, knee flexion, hip flexion with the knee extended, plantar flexion, hip internal rotation, and shoulder abduction and rotation. Some deformities result from neglect and ignorance, but certain types cannot be prevented by the most faithful treatment.

The acute stage may be considered over when the patient is out of isolation. Again the objectives are to get rid of residual muscle shortening reactions and discomfort, to continue muscle reeducation and to begin resistance exercise in order to restore strength. Walking is permissible if body strength permits and deforming stresses can be avoided. Residual tightening can be treated by whirlpool or Hubbard tank treatments followed by fractional stretching. Incoordination and substitutions are vigorously combatted.

In the intermediate phase one often uses an interrupted schedule, building the basic treatment around progressive resistance exercises. As is true of many other diseases, increasing complexity of procedures and equipment may result in care of selected patients in this phase at special centers, whereas early treatment often can be properly done in the small hospital and by the average practitioner, internist or pediatrician.

One should prescribe progressive resistance exercises from four to six times weekly until no further gains are noted. The ten resistance maxima or assistance minima give a quantitative measure of improvement in each muscle or muscle group. At the conclusion of such a bout of exercise one usually gives the patient a three to four months' vacation but makes such checks as are necessary on scoliosis, foot mechanics, brace fits and such. Whenever possible home treatment by means of progressive resistance exercise should be used, but the level of achievement should be checked at weekly visits. Progressive resistance exercise is invaluable in helping the patient to gain realistic insight into his limitations and the permanence of disability. When two or three bouts of exercise fail to budge the functional level of a muscle, the patient is convinced.

Intensive physical therapy after the twelfth month usually is unnecessary unless early treatment has been utterly neglected.

The worst abuses of physical therapy in poliomyelitis consist of useless treatment and overtreatment. The most common abuse is failure to define goals and prescribe precisely.

This article gives as examples a prescription of a hypothetical case for each phase of the disease.

Poliomyelitis and the Laryngologist

Marvin W. Simmons, M.D., Fresno, Calif. In ARCHIVES OF OTOLARYNGOLOGY, 55:1:55, January 1952.

Only in the past two or three years has the laryngologist been considered an essential member of a consultant staff in the treatment of poliomyelitis. Still, in some quarters his position today is challenged, in spite of the increasing evidence in the literature that he offers a therapy that saves lives. His knowledge of respiratory problems acquired by studying foreign bodies, laryngeal cancer, tracheobronchitis, postoperative atelectasis, and laryngeal edema can be applied directly to the respiratory problems in acute poliomyelitis. As a member of the poliomyelitis team, the laryngologist should observe the patient early, be able to recognize any impending respiratory difficulty, and act accordingly. He should not be considered simply a technician to be called to act on the decision of someone else.

This paper reports on 101 patients with acute poliomyelitis observed at Fresno County General Hospital, Fresno, California in 1950. In twenty-seven cases diagnoses of bulbar and bulbar-spinal poliomyelitis were made. Tracheotomies were performed on fifteen patients.

The problem during the year was

one of education. The medical staff, nurses, and attendants had to be taught to observe early in patients admitted for poliomyelitis any symptoms indicating a respiratory problem. Although clean-cut indications for tracheotomy were listed, their applications were difficult at times.

Familiarity with the symptoms associated with inadequate respiratory exchange may prevent many deaths. Headache, increased mental activity, agitation, sweating on the forehead, dyspnea, uncooperativeness, anxiety, and restlessness are noted early. Euphoria at times also is seen. Later with progression of events, confusion disorientation, and irrationality are observed, leading to convulsions, unresponsiveness, lethargy, and coma.

When a patient becomes antagonistic toward efforts to help him and shows combativeness toward the attendants, interference with respiration must be suspected immediately. Treatment is needed immediately. Tracheotomy is a safe procedure, to be performed early, and is more effective according to the author than postural drainage and aspiration alone.

Myositis Ossificans Occurring in Poliomyelitis: Report of a Case

W. E. Hess, M.D., Salt Lake City, Utah. In ARCHIVES OF NEUROLOGY AND PSYCHIATRY, 66:5:606, November 1951.

A review of the literature fails to produce a specific incident of myositis ossificans developing in a paralytic patient whose paralysis was the result of anterior poliomyelitis. Since it is well known that myositis ossificans occurs in more than four per cent of patients with paraplegia from other causes, it would appear that it could occur with poliomyelitic paraplegia. A case is reported which demonstrates this.

A seven-year-old girl with anterior poliomyelitis was given treatment consisting of routine physical therapy—daily application of hot packs, muscle reeducation, passive stretching of all taut muscle groups, and bed rest on a firm mattress with a footboard. Use of the hot packs was terminated after six weeks, when all muscular tenderness had subsided. Active and passive physical therapy was then continued. Three months after admission, while undergoing stretchings of the hamstring muscles, the patient sustained an oblique fracture of the right midfemoral shaft. Evidence of a preexisting myositis ossificans was already present, as shown by the immediate postfracture roentgenograms. The process proceeded to ossify and to consolidate further during the period of immobilization of the fracture.

The likeliest cause of the myositis ossificans was trauma from overzealous stretchings in the treatment of the paralysis. The danger arising from such stretching is emphasized.

Neurological Changes in Anterior Poliomyelitis and Their Implications in Treatment

Edward B. Schlesinger, M.D., New York. In ARCHIVES OF NEUROLOGY AND PSYCHIATRY, 66:5:600, November 1951.

The Kenny treatment of acute and subacute anterior poliomyelitis rests in part on unsound physiological concepts. This state is in part due to the neglect of the disease by the neurologist and the misinterpretation of clinical signs by less adroit students of the nervous system. The concept of treatment as being largely a problem in combating muscle spasm is erroneous. The term "muscle spasm" as used in describing clinical patterns in poliomyelitis bears no resemblance to the term as understood by the neurologist. The clinical changes in poliomyelitis represent progressive manifestations of involvement of various parts of the central nervous system and vary strikingly from case to case, depending on the areas affected and the severity of the lesions. Three phases of neurological changes and their implication are described. The fallacy of attempting to treat all phases by a single therapeutic agent, thermal or pharmacological, is discussed. A clinical experiment designed to demonstrate the latter point is described.

Schlesinger draws the following conclusions:

The Kenny method of therapy is sound in respect to its goal of preventing deformity, shortening of muscles, and loss of muscle volume by range-of-motion exercises.

The underlying concepts of Kenny doctrine are unsound physiologically and lead to ritualistic and empirical management of the disease process.

Members of the medical profession have been quick to improve traditional technics by adopting some of Kenny's methods, but lamentably uncritical of her concepts.

The Kenny and generally medically accepted concepts of "muscle spasm" in poliomyelitis probably are erroneous in physiological terms.

"Muscle spasm" actually can be divided into large groups of pathological neural mechanisms of clinical significance.

The various entities which are grouped under the name of "muscle spasm" cannot be expected to respond to a single therapeutic agent.

To be of value, hot packs, muscle relaxants, and such, must be exhibited in proper relation to the mechanisms at play at a given point in the progress of the disease.

The evidence adduced discounts the value of muscle relaxants during at least one phase of the acute disease.

After-Care for the Poliomyelitis Patient

Morton Hoberman, M.D., New York City. In NEW YORK STATE JOURNAL OF MEDICINE, 52:3:323, February 1, 1952.

After-care for the poliomyelitis patient following hospital discharge is an aspect of total care which has not received sufficient emphasis. Perhaps some of the indifference to this phase of the disease is due to a lack of appreciation of what adequate after-care entails. It may also be related to an oft-repeated statement attributed to Bennett, to the effect that nearly all poliomyelitis patients exhibit 80 per cent of their eventual maximal return of muscle strength within nine months after onset, and the impression that after eighteen months no further increase in muscle strength can be expected. Another possible reason results from a concept that, after discharge from the hospital, only functional activity is of importance and is sufficient to bring the affected musculature to its greatest strength and endurance.

After-care for the poliomyelitis patient is a long-term program, whether the patient is mildly, moderately, or severely involved. As might be expected, the moderately and severely involved poliomyelitis patients usually receive more thorough aftercare for longer periods than do the so-called nonparalytic and mildly involved patients. This is unfortunate, since it cannot be emphasized too strongly and too often that deformities, contractures, and other undesirable residuals can and do, in fact, occur in any phase or period of the disease as well as in any type of patient. Also, the vastly superior numbers of the latter type of patients (nonparalytic or mildly involved) make it imperative that they also

be followed carefully for sufficiently long periods after discharge from the hospital.

Hydrogymnastics—How Good?

C. L. Lowman, M.D., Los Angeles, Calif. In HOSPITAL MANAGEMENT, 73:1:138, January 1952.

The use of pools predates the Bible, and yet today there are more emphatic endorsements to this ancient technic than ever before in medical history. At the recently concluded Second International Congress on Poliomyelitis which was held in Copenhagen, Denmark, quickened interest was shown in hydrogymnastics for many types of distressing conditions, such as flaccid and spastic paralysis, joint and postsurgical conditions, and of course most notably the disabilities resulting from poliomyelitis.

Today there are approximately 125 exercises for muscle reeducation which are possible in water which are impossible anywhere else. There are five principle reasons for the ever increasing acceptance of the hydrogymnastic treatment: (1) There is greater ease of movement of body parts in water, due to natural laws which govern buoyancy and viscosity. The improved ease of movement is especially valuable in painful and neuritic conditions, as in the subacute stage of poliomyelitis. (2) The treatment is excellent in postoperative cases where plastic joint surgery or tendon transplantation has been done. (3) The use of therapeutic pools usually brings out the maximum degree of enjoyment and personal interest on the part of the patient. (4) The hydropathic effect on nervous and circulatory systems throughout the skin is of definite value. (5) The improved morale on the part of the patient is beneficial, both psychologically and physiologically.

Hydrogymnastic treatment is not "swimming," nor is it simple. If the average swimming instructor, without thorough and intensive training in anatomy, normal and abnormal kinesiology, and other such allied sciences attempted to take paralysis cases into the water, there is every possibility that he may do more harm than good.

Of the various types of work in connection with the treatment, none is sufficiently simple to be handled by untrained personnel. Work on the submerged plinth is one subdivision in the application of this modality, while free floating work is another. Working with some form of partial fixation for stabilizing either the shoulder girdle or the legs and pelvic girdle is still another form.

Generally speaking, the plinth work follows very closely the muscular reeducation work done out of the pool. In the free floating movement, any exercise without assistance is made against resistance of the water, either on the surface or submerged. Floating with assistance seems indicated for very weak or new cases who need support, either physical or psychological.

The value of resistive exercises has long been recognized by physicians, and there is no type of such therapy in which the resistance factor is as uniform as that of water. To overcome buoyancy requires a certain effort. If a physical therapist applies resistive exercises skillfully, work can be localized to definite sets of muscles. If the resistance should be increased, hand paddles for the arms or wooden splints for the legs may be used to supply added surface to the resistance of the water.

Thus it can be seen that proper hydrogymnastic treatment is far from a simple swimming lesson, and a simple knowledge of kinetics is not by any means sufficient to qualify the person administering treatment.

Hydrogymnastic treatment now seems firmly established in medical practice for the relief of pain and suffering. Doctor Lowman feels that it can be more, in a general sense, than any other modality in physical therapy.

Importance of Rest in the Treatment of Early Convalescent Poliomyelitis

Wallace Green, M.D., New York. In AMERICAN JOURNAL OF DISEASES OF CHILDREN, 83:1:4, January 1952.

In the accepted definition of the term, there is no known "cure" for poliomyelitis. During the early convalescent stage when the greatest amount of recovery is taking place, various forms of treatment are being used, the particular modality chosen and championed being a personal choice rather than one scientifically proven to be the most efficacious.

There are advocates both for and against pool therapy, electrical stimulation of muscles, drugs, physical therapy, early ambulation, and so forth. Out of this list of treatments must come the realization that none is specific; that as anterior horn cells recover, muscle power spontaneously returns and that a form of therapy must be selected which impedes this natural recovery as little as possible.

This paper is based upon personal daily supervision of over 200 patients in the early convalescent stage of poliomyelitis during a recent epidemic and was written to minimize the value of any specific form of active therapy and to emphasize the importance of the unheroic and unglamorous role of rest.

The patients were placed upon one of three regimens: (1) unrestricted ambulation and tricycle riding; (2) ambulation and tricycle riding for three one-hour periods daily, and (3) bed rest except for a brief period of physical therapy daily.

Groups one and two received the same physical therapy treatment as the third, namely, selective muscle reeducation alternately on a table or in a Hubbard tank and manipulation of each joint through its normal range of motion. Patients in all three groups were maintained in neutral joint alignment when in bed.

Observation showed that the most consistent improvement occurred among patients in the group that was kept at rest except for a brief daily period of supervised muscle reeducation. It was noted that the least amount of improvement and in many cases regression occurred among patients in the group allowed unlimited activity. In the latter group (group 2) it was also noted that patients tended to acquire persistent pathological gaits; smaller children especially, once they had acquired the knack of stabilizing themselves through a pathological gait, would do so too in order to delay fatigue.

It was especially difficult, considering the nature of poliomyelitis and its psychological impact upon the patient, the family, the community, the trained and semitrained personnel who were all desperately eager to engage and cooperate in any form of intense active therapy, to insist upon a regimen involving primarily rest. In these days, when fund-raising campaigns for poliomyelitis and general rehabilitation are constantly before the public, to advise rest as the prime treatment lays one open to criticism, at the best of lagging behind modern technics and at the worst (as actually did happen on several occasions), of having a callous disregard for the welfare of unfortunately stricken patients.

Skeletal deformities were pre-

vented by maintaining neutral alignment of involved extremities and by putting each joint through its normal range of motion daily. To maintain awareness of muscle action, selective muscle reeducation was carried out for a half-hour period daily. It was to the natural recuperative powers of the anterior horn cells that the greatest credit went for increase in muscle power. The only method which consistently decreased power in an already paretic muscle, outside of permitting it to be overstretched by a more powerful antagonist, was to exhaust the muscle through overactivity.

Rest and Poliomyelitis

Aladar Farkas, M.D., New York. In ARCHIVES OF PEDIATRICS, 69:1:1, January 1952.

In this study an attempt is made to outline the pathomechanism of poliomyelitis, departing from two sets of observations.

The recognition that bed rest is capable of arresting the progress of poliomyelitis in its preparalytic stage was proved by Russell. His observations, in less definite form made already by Wickman, have been confirmed by Hargreaves, and by Horstman. The method of treatment advanced by this author, termed "positional-nutritional method," and applied in the acute, subacute and chronic stages, served as the other set of observations. Maximum of rest is employed by keeping the patients in bed in head-down position for many months. Rest is complemented with high vitamin and liver diet, forced respiratory exercises, and a new form of physical therapy, termed "pattern stimulation." The partial revival of muscle function in the chronic cases, and its restoration in the acute and subacute cases, were accomplished in twenty-four cases altogether.

That an acute, contagious, inflammatory disease, already in progress, could be halted by simple bed rest seems to be a fundamental observation of the utmost importance.

The preparalytic stage of poliomyelitis is encephalitic in nature. Since the continuation of physical activity during the preparalytic stage is followed by paralysis one to three days later, while bed rest prevents its development, it is proper to assume that the means of muscular stimulation and that of virus propagation are identical.

Poliomyelitis in a Pair of Identical Twins: Report of Cases

Robert R. Haumeder, M.D., Berkeley, Calif. In ARCHIVES OF PEDIATRICS, 68:8:357, August 1951.

Reports of the appearance of paralytic poliomyelitis in two or more members of the same family have appeared occasionally, but its appearance in identical twins has been reported only rarely.

This is a report of the case histories of a pair of five-year-old identical twin boys who developed similar forms of paralytic poliomyelitis.

The first boy was given no plasma until the fourth hospital day, but he declined rapidly and died on the fourth day, in apparent respiratory failure. The patient had been treated with hot packs during his entire hospitalization and received Priscoline, 50 mgm. every four hours, the last two days of his illness.

The second boy, identical twin to the one described above, was given plasma immediately and was started on Priscoline and oxygen. On the fourth day this patient was feeling well, and his temperature was normal. On the sixth day, he showed slight improvement of function of the left arm, and spasm of the back and hamstrings was decreasing. He was discharged to a private physician on the eighth hospital day for further physical therapy. There was only slight weakness of the left arm, but the right arm was still completely paralyzed. Three weeks after discharge the patient had recovered full use of the left arm, but the right remained paralyzed.

The possibility of a hereditary tendency to develop poliomyelitis and paralytic poliomyelitis has been mentioned before. If such a tendency exists it would be even more likely to appear in identical twins; with a similar onset one might well expect a similar course in such cases. These cases were so similar in onset that everyone feared the probability of a similar outcome in the second twin.

At the time of admission of the first patient, plasma was not being given routinely in the treatment of poliomyelitis patients, because it was being reserved for those deemed more seriously ill. This was the reason for not giving it earlier to the first patient. Because the second patient seemed so much worse, it was started early in him.

Exactly how much difference in therapy affected the outcome in the second case cannot be determined; had plasma been withheld until the fourth day, the second twin might have succumbed. There is a definite possibility that the plasma did have some beneficial effect although the presence of antibodies has been fairly well ruled out by some investigators.

A recent report on poliomyelitis mentions the use of plasma and, although the authors could not show any statistical proof of its efficacy, they state that on clinical impression it often seems to be of definite benefit.

Haumeder feels that plasma played a part in halting the progression of symptoms and further believes that it should be used in all cases, and used early.

Second Attacks of Acute Anterior Poliomyelitis

A. T. Coffee and W. D. Paul. In NEUROLOGY, 1:419, November-December 1951. Abstracted in THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 148:6:495, February 9, 1952.

Patients have been observed who, during the convalescent phase of poliomyelitis, had a recurrence of acute systemic symptoms, in conjunction with an extension of paralysis to myotomes previously unaffected. This situation has been noted weeks, and sometimes months, after the initial phase of the disease. Since man is known to harbor the poliomyelitis virus in his nasopharyngeal secretions and/or gastrointestinal tract as a convalescent carrier for many months following the acute phase of the disease, progression or development of additional paralysis during a period of three or four months after the initial infection is considered a recrudescence of the original infection, whereas those appearing two or more years later are designated as a re-infection. Coffee and Paul add one case of their own observation to 49 previously recorded cases of second attacks of poliomyelitis. The case reported here represents an instance of two distinct attacks, separated by an interval of 24 years. Factors responsible for the occurrence of second attacks of poliomyelitis are as yet little understood, but the authors mention several possible explanations such as antigenically different strains of poliomyelitis virus, inability of some patients to produce antibodies, and loss of immunity in the course of time. A combination of such factors may be present in an individual case.

Influence of Procaine Infusions on the Temperature of Muscle and Skin of Poliomyelitis Patients

Steven M. Horvath, Ph.D., Harold N. Taylor, Capt. M.C., U.S.A., Attie Y. Werner, Ph.D., and W. D. Paul, M.D. In AMERICAN JOURNAL OF PHYSICAL MEDICINE, 31:1:14, February 1952.

Forty patients with acute poliomyelitis were given intravenous infusions of procaine. Peripheral vasodilatation as indicated by elevated toe temperatures was observed in only 17.7 per cent of these patients The mean temperature elevation in noninvolved and involved muscles was approximately 0.2 C. This increase cannot be considered to indicate an augmented blood flow through the muscles. The temperature of the gastrocnemius muscle of the involved extremity was lower than in the noninvolved extremity and appeared to be, at least, casually related to the degree of involvement.

Poliomyelitis in Adults in Seattle in 1949

John L. Bakke, M.D., and James W. Haviland, M.D. In NORTHWEST MEDICINE, 50:11:846, November 1951.

The cases of poliomyelitis occurring in adults during one season and observed on a single ward are presented as probably representative of what was occurring simultaneously statewide. This report covers sixty adult poliomyelitis patients admitted to the medical service of King County Hospital in Seattle in 1949.

Males predominated in paralytic cases, but very few paralytic cases occurred in the group over thirty-three years of age. It is the general consensus that incidence of poliomyelitis in pregnant women exceeds that in the population at large. Furthermore, they are more susceptible to bulbar paralysis. Although debated by some, it seems fairly well established that tonsillectomy does predispose to poliomyelitis, especially the bulbar form. Symptoms of headache, stiff neck, malaise and aching of muscles, particularly those of the back and thighs, occurred in virtually all sixty patients.

Muscle examinations by the physical therapy department and orthopedic surgeons revealed that fourteen of the nineteen patients with spinal paralysis had predominance of paralysis on the right side and three of five patients with cranio-bulbar paralysis had predominance of weakness on the dominant side.

In addition to careful general management, therapy consisted of frequent hot moist packs, bed boards, and appropriate daily physical therapy.

Three of thirteen patients had abnormal electrocardiograms. Attempts to isolate poliomyelitis virus from fresh myocardium of a fatal case with clinical evidence of myocarditis were unsuccessful.

Certain Procedures for the Surgical Rehabilitation of the Hand in Poliomyelitis

Thomas Gucker, 3rd, M.D., Warm Springs, Ga. In THE JOURNAL OF THE MISSOURI STATE MEDICAL ASSOCIATION, 49:3:227, March 1952.

Most patients afflicted with poliomyelitis look forward anxiously to the time when they can walk again and get about in a normal manner, since one usually thinks of paralysis in poliomyelitis as producing cripples because of involvement of the lower extremities. However, almost without exception adequate use of the hands is by and large much more necessary for the patient's ultimate employability and over-all happiness.

From the time of onset of weakness of true paralysis involving the forearm and hand, the first consideration must be given to the maintenance of normal alignment of the thumb, fingers, and wrist and the prevention of progressive contractures followed by fixed deformity of the bones of the hand. Too much emphasis cannot be placed on the need for properly fitting splints which maintain the hand, fingers, and thumb in a position of function. Such splints should be worn all night and as much of the day as necessary to prevent progressive contractures. Motion of all joints must be instituted as soon as tolerated and increasing mobility should be gained by carefully planned daily passive and active movements to maintain joint mobility. In a large measure the ultimate functional use of the hand depends directly on the adequacy of care during the first few months following paralysis from poliomyelitis.

The most successful program for rehabilitation requires that there be continued coordination and cooperation between all those who are at the onset or subsequently will be responsible for the several aspects of the patient's over-all treatment program.

Rehabilitation Techniques with Braces and Crutches: IV. Methods of Falling and of Getting Down and Up from the Floor

Morton Hoberman, M.D., and Erbert F. Cicenia. In AMERICAN JOURNAL OF PHYSICAL MEDICINE, 31:1:21, February 1952.

The subject of falling is complex as most of us have an inherent fear of falling. Practically all disabled persons have a fear of loss of support and falling. Although we cannot expect to conquer these fears completely, we can do much to promote a calm self-assurance and to quicken our presence of mind in situations where the inherent fears come into play.

Physically disabled persons can be taught the "know how" through adherence to simple safety measures and by early instruction in the proper way to ease a fall. The cardinal safety measure is a progressive approach from the simple to the more difficult. If the preliminary fundamentals are well learned, the danger of falling will be minimized only to unpredictable hazards encountered during the course of a normal day.

Instruction in falling should be begun early in the individual's rehabilitation program, even before braces and crutches are used. Falling always should be practiced on well-padded surfaces, such as a soft mat, mattress, or if outdoors, on a soft-heavily-grassed spot.

This installment of rehabilitation technics with braces and crutches outlines methods of falling and of getting down and up from the floor. Several methods are described and reinforced by excellent illustrations, since as the more technics achieved, the greater the ability to maneuver the body under all circumstances. The methods described in this article are mainly for patients with complete or partial paralysis of the lower trunk and both lower extremities. However, with some ingenuity, these methods can be modified for those patients with more involved residual physical disabilities.

The Role of Vocational Adjustment in Rehabilitation

Everill W. Fowlks, M.D., Albert L. Cooper, M.D., and L. Kenneth Shumaker, M.A., Portland, Oregon. In ARCHIVES OF PHYSICAL MEDICINE, 33:3:137, March 1952.

This paper is intended to delimit and describe the work of the hospital vocational adviser rather than to

discuss the general nature of all the rehabilitation services. The importance of the contribution which could be made by psychology to the rehabilitation of the disabled was recognized by Dr. Ira Scott and his staff in the Veterans Administration long before the need for the Vocational Advisement Service of this agency of government was made acute by World War II.

The vocational adviser who works with the rehabilitation services of the hospital is a psychologist who has, in the main, two types of equipment. The first is called the psychometric equipment, and the second is called the clinical technic. Psychological testing at its best is the study of the reactions and performance of a given subject under well controlled conditions over a relatively brief time, for the purpose of ascertaining how this individual will fit into the society of which he is a part.

measure of the extent to which the ideal has been realized. The picture here is not as encouraging as it might be, and it now seems that the greatest hope for improvement lies with the general hospital. While the purpose of this paper is to discuss certain practical aspects of organizing and administering a department of physical medicine and rehabilitation in a general hospital, a prior consideration is a clear understanding of the function and scope of this relatively new specialty.

The organization of a department of physical medicine and rehabilitation in a community hospital must begin with the community. Intelligent planning requires a thorough knowledge of local needs and resources, and utilization of them should stress integration. If planning is realistic as well as imaginative, many resources and much equipment not located in the hospital itself may be used in various stages of the rehabilitation process, with a net result fully as satisfactory as those achieved with vastly greater outlay in large cities. For example, tools and machinery of the local vocational school may be scheduled for use under a cooperative plan; or certain exercising facilities in the high school; or graduated work plans with the cooperation of industrial plants.

Book Reviews . . . . .

A Device to Facilitate Standing from a Sitting Position: For Patients with Severe Residuals of Poliomyelitis

Leslie Blau, M.D., Joseph Phillips, B.P.E., and Donald L. Rose, M.D. In ARCHIVES OF PHYSICAL MEDICINE, 33:3:159, March 1952.

For many of the patients with severe muscular weaknesses as a result of an attack of poliomyelitis of the paralytic, spinal-type, the simple activities of daily living often are impossible to attain except in the sense of their accomplishment as a technical feat. A device is described which has proved to be extremely useful to such patients who could not stand from a sitting position without its help. It consists of three main sections: adjustable horizontal bars, parallel bars, and a seat that fits between the parallel bars. With the use of the equipment, such a patient can assume the erect position independently without additional assistance.

Rehabilitation Unit

H. Worley Kendell, M.D., Peoria, Ill. In THE MODERN HOSPITAL, 78: 3:67, March 1952.

Since the ideal of comprehensive medical care cannot be realized without physical medicine and rehabilitation, the extent to which these restorative technics are offered as an essential part of the community health program is more or less a

A Translation of Galen's Hygiene (De Sanitate Tuenda). *By Robert Montraville Green, M.D., Emeritus Professor of Anatomy, Harvard Medical School, Boston, Massachusetts, with an introduction by Henry Sigerist, M.D. Hard cover; price, $5.75; pp. 277. Published by Charles C Thomas, Springfield, Illinois, 1951.*

This book, the first modern language translation and the first complete English version of Galens' Hygiene, was undertaken at the suggestion of Dr. Sidney Licht. It was done primarily from Kuhn's edition of the Greek text. The author states that one of his greatest difficulties was to find, for Galen's technical terms, English equivalents which were both scientifically accurate and at the same time popularly intelligible.

Galen's work is divided into six books. 1) The Art of Preserving Health, 2) Exercise and Massage, 3) Apoltherapy, Bathing and Fatigue, 4) Forms and Treatment of Fatigue, 5) Diagnosis, Treatment and Prevention of Various Diseases, 6) Prophylaxis of Pathological Conditions.

In Galen's time an educational system that tended to develop the perfectly balanced man, mentally and physically, was in vogue. This was a tremendous stimulus to the development of the study of hygiene. From Galen's book we learn that the physician was not the only health educator, but that the gymnast and the masseur played an important role. Theon was one of these and he is mentioned numerous times. Galen was critical of these people and other personnel of the gymnasium and bath, because he felt that his hygiene was a scientific study and believed that it belonged under the supervision of a physician.

Today we would call Galen's hygiene applied physiology. Like the physiologist Galen was studying the normal functions of the body and attempting to create conditions most favorable to the functioning of the various organs and the body as a whole.

Galen describes the four humors constituting the body, blood, phlegm, yellow bile and black bile. He also presents the concept of the elementary qualities of hot, cold, dry, and moist which occur in the body in degrees and combinations. When the humors are of the right quantity and the qualities correctly balanced, the individual is in good health. The aim of the hygienist is to maintain health by maintaining this proper balance.

The six books of this work explain how this is accomplished through the prescription of the correct amount and kind of food and drink, sleep, exercise, massage, and sexual activity. It is brought out that individuals differ in constitution; for example, children are primarily of moist quality, and the aged of dry quality. In prescribing hygiene, the physician must consider the age and constitution of the patient and also the season and the climate in which he lives. Great emphasis is placed on the effect of

exercise, massage, and different types of baths.

Galen's observations on the physiology of various kinds of exercise are fascinating. His treatment of the geriatric patient shows his observation to be centuries ahead of his time. His descriptions provide an interesting history of the times, and his medical cases show that he was a meticulous observer in the fields of anatomy, pathology, and physiology. Many of his theories and practices are not acceptable in the light of modern discoveries, but many more of his theories have been proved correct centuries later.

A Bibliography of Infantile Paralysis. 1789-1949. *Edited by Morris Fishbein, M.D. (Editor Excerpta Medica) and Ella M. Salomsen (Chief Medical Department John Crear Library, Chicago) with Ludvig Hektoen, M.D. (Editor Emeritus Archives of Pathology). Second Edition, Pages 889, J. B. Lippincott, Philadelphia, 1951.*

This bibliography has been prepared under the direction of the National Foundation for Infantile Paralysis, and represents the results of a monumental task of searching the medical literature and selecting material relating to the investigative and clinical study of poliomyelitis. The editors, who have recognized ability, have constructed abstracts and annotations of articles, handbooks, and textbooks in a masterly fashion. The chronological arrangement captivates an interest in medical history and an appreciation of the progress which has been made in studying the disease, infantile paralysis or poliomyelitis, and moving towards its management and control.

In the preface of the First Edition which was published in 1946, Mr. Basil O'Connor indicated the problem of accessibility to material in some countries. The Second Edition has included corrections and additions in the chronological listing of material up to 1950. Over 10,000 abstracts and annotations have been compiled, and nearly one-third of them indicates work that has been done during the past ten years. The progress that has been made in the twentieth century and particularly the recent decade reflects the activities of the National Foundation for Infantile Paralysis in the areas of research, education, and patient care.

Besides the chronological listing, a comprehensive index to subject matter and an index to authors provides an excellent guide to resource material pertaining to the accumulating knowledge about poliomyelitis.

Handbook for One-Handers. *By Aaron Danzig, Treasurer of the Federation of the Handicapped, Inc. Paper bound: price, $.50. Pp. 22. Federation of the Handicapped, New York, N. Y.*

This is a manual in which are described some "tricks" for performing a few simple daily living activities by a "one-hander" such as buttoning sleeves, tying shoes, suggestions for sports participation, some superficial recommendations for the development of social poise.

No bibliography is listed. The suggestions seem to have been gathered from "one-handers." There is no new contribution for the therapist with a little experience in rehabilitation of the handicapped; however, the material is written in a non-professional manner especially for the person "temporarily or permanently compelled to meet his daily needs with the use of one hand." The author writes with glib assurance that a "one-hander" can be more successful than a two hander in every sphere of activity he endeavors.

It is possible that the person who has not had to perform some of his own self care will be taught by reading, to do some of the specific activities; will be encouraged to practice others, and will try others not mentioned.

The Federation believes "social action" is necessary to "expand and refine" information, and wishes to be the clearinghouse in gathering and disseminating new ideas which may emerge from the application of the manual by "one-handers." It will revise the manual for greater mutual benefit as individuals try these suggestions and write to the Federation of their own experiences and methods of making personal and social adjustment.

One Hand Piano Method. *By Stella Shaw. Paper cover. Price, $1.50. Mills Music, Inc., New York City, 1952.*

This book introduces a piano course for beginners who do not have full facilities of both hands. These include amputees, hemiplegics, and others handicapped by arthritis, cerebral palsy, or poliomyelitis for whom the performance of music may have therapeutic value.

The music has been arranged so that the effect is the same as if it were being played with two hands. The book is intended for the beginner, and offers a simple course of fundamentals for one hand playing.

The author states that the method can be self-taught. Early in the course the beginner is introduced to the playing of familiar melodies to aid him in developing technic, and to give him the psychological pleasure of being able to create music.

The Child in Health and Disease. *A Textbook for Students and Practitioners of Medicine. By Clifford G. Grulee, M.D. and R. Cannon Eley, M.D. Hard binding; price, $12.50; pp. 1208. Published by The Williams and Wilkins Company, Baltimore 1952.*

The editors have published in this 2nd edition, the efforts of 87 contributors as an up-to-date textbook of clinical pediatrics for the medical students and the practitioner in the home. A critique of the specific content material would prove encyclopedic, thus only the presentation and the scope will be touched on here.

For a book designed principally as a text the publishers have made easy reference almost impossible because of such factors as small print, closely spaced lines, poorly demarcated charts and subheadings which frequently defy easy detection. Even the revision and amplification of the index fail to provide adequate reference.

In its physical and treatment aspects and, to a lesser extent, the emotional implications of its multitude of clinical subjects, it is up-to-date. However, in spite of more emphasis on mental hygiene and such new chapters as adoptions and the medical supervision of summer camps, it omits such phases as pediatrics and preventive medicine in public health. It seems unfortunate that such factors as child conferences, school health and safety programs, programs for the handicapped and exceptional children, and the physician's community responsibility for the health of children have been generally neglected.

For the physical therapist in spite of such chapters as Cerebral Palsies, and an excellent chapter on Poliomyelitis, the book presents little of interest. It remains primarily a clinical and pathological textbook. However, as a supplemental book in the medical library some of its chapters have much to offer provided they are read with a sound basic knowledge of the subject.

A Textbook of Clinical Neurology. *By Israel S. Wechsler, M.D. Clinical Professor of Neurology, Columbia University, New York. Hard cover; price, $9.50. Pp. 801; illus. 179. W. B. Saunders Company, Philadelphia, 1952.*

Wechsler's Textbook of Clinical Neurology has long been a favorite and popular book for medical students. In recent years, however, it was obvious that much of the newer material was not made available. In the seventh edition the text has been so thoroughly revised that it is practically a new treatise, so that what was formerly recognized as a good book on neurology, now is even a better one. In addition to the usual chapters on neurological examination, disturbances of the spinal cord, brain, and peripheral nervous system, there is also an excellent chapter on the neuroses. Another additional feature which will appeal to many readers, is a fine history of neurology. The book is well illustrated, and can be heartily recommended for students as well as physicians who wish to keep abreast of the specialty of neurology.

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Physical Therapy Association.

MEET OUR NEW CONTRIBUTORS *(Continued from page 345)*

Carmella A. Gonnella, Assistant Director, Physical Therapy Department, Gonzales Warm Springs Foundation, attended the University of Pennsylvania where she received her B.S. degree in 1943, and her master's degree a year later.

Miss Gonnella's physical therapy training was at Percy Jones General Hospital where she received her certificate in 1946. She was a physical therapist in the U.S. Army, and later was on the staff of the Research Hospital, University of Illinois. Before accepting her present position at Gonzales, Texas, she was a graduate student and physical therapist at the Georgia Warm Springs Foundation.

Miss Gonnella is a member of the American Physical Therapy Association, the American Registry of Physical Therapists, and of Pi Lamda Theta, national honorary fraternity.

A. David Gurewitsch, M.D., Assistant Clinical Professor of Physical Medicine and Rehabilitation, College of Physicians and Surgeons, Columbia University, received his medical education at Basel University in Switzerland.

In addition to his teaching responsibilities, Dr. Gurewitsch is Assistant Attending Physician at Presbyterian Hospital; Medical Director, Blythedale Hospital, Valhalla, New York; and since 1939 has been in charge of Physical Therapy at the Neurological Institute, New York City.

Dr. Gurewitsch is a diplomate, American Board of Physical Medicine and Rehabilitation, and holds membership in the American Society of Physical Medicine and Rehabilitation, the American Congress of Physical Medicine and Rehabilitation, the New York Society of Physical Medicine and Rehabilitation, and the American Medical Association.

Merton E. Miller, Supervisor, Poliomyelitis Unit, Physical Therapy Department, Charity Hospital of Louisiana at New Orleans, was graduated from the University of Buffalo in 1949 with a baccalaureate degree in education. The same year he enrolled in the Physical Therapy School, Baruch Center of Physical Medicine, University of Virginia, and received his physical therapy certificate in 1950.

Mr. Miller is a member of the American Registry of Physical Therapists, and holds the office of Secretary-Treasurer of the Louisiana Chapter, American Physical Therapy Association.

Paul Philip Proud, Instructor in Physical Rehabilitation for Nurses at the Neurological Institute, received his B.S. degree from East Stroudsburg State Teachers College in 1949, and enrolled in the Physical Therapy School at Columbia University, where he was awarded his certificate in 1950. He completed requirements for his master's degree at Columbia one year later, and has remained at Columbia-Presbyterian Medical Center as physical therapist and instructor.

Mr. Proud is a member of the American Physical Therapy Association and the American Registry of Physical Therapists.

David Rubin, M.D., Staff Physician, Kabat-Kaiser Institute, Santa Monica, California, attended the University of Chicago where he was awarded his Ph.D. in 1943. His medical degree was received from Northwestern University Medical School in 1947.

Dr. Rubin, in addition to his work at the Kabat-Kaiser Institute, is Visiting Staff Physician, Department Physical Medicine, Los Angeles County General Hospital.

Duane Arthur Schram, M.D., Medical Director, Gonzales Warm Springs Foundation, was graduated from the University of Washington with a B.S. degree, and from McGill University where he received his medical degree in 1944.

Dr. Schram is a member of the American Board of Physical Medicine, and the American Congress of Physical Medicine.

Dorothy Spark, Physical Therapist, Crile Veterans Administration Hospital, Cleveland, Ohio, received her nursing education at the Cleveland State Hospital and Western Reserve University, and her physical therapy preparation at the Cleveland Clinic in Ohio. She has taken instruction at the University of Minnesota and Georgia Warm Springs Foundation.

Miss Spark has been a member of the physical therapy departments of the Cleveland City Hospital, Columbus Children's Hospital, and has assisted during emergencies through the Polio Recruitment Service.

She is a member of the American Physical Therapy Association, the American Registry of Physical Therapists, and the American Nurses' Association.

Mrs. Marion B. Stewart, Technical Director, Physical Therapy Department, Charity Hospital of Louisiana at New Orleans, is a graduate of Sargent Normal School of Physical Education, and received her B.S. degree from Louisiana State University.

Following her physical therapy preparation in Boston, Mrs. Stewart became one of the first supervisors of the Infantile Paralysis Clinic at the Massachusetts General Hospital.

Mrs. Stewart was Head Reconstruction Aide, U.S. Medical Corps 1918-1920, and was associated with the Orthopedic Section, Mayo Clinic. She has been Clinical Assistant Professor of Physical Medicine, Louisiana State University School of Medicine, New Orleans from 1931 to the present.

She is a charter member of the American Physical Therapy Association, and is a member of the American Registry of Physical Therapists.

Classified WANT-ADS

WANTED: IMMEDIATELY, 2 qualified female physical therapists. September 1, 1952, 1 female physical therapist. General Hospital Clinic with outpatient service. No cerebral palsy, polio or mental cases. Five day, 40-hour week, holiday, sick leave and vacation privileges. Quarters optional. Good beginning salary. Annual increases. Write to Miss Miriam E. Miller, The Johns Hopkins Hospital, 601 N. Broadway, Baltimore 6, Md.

WE HAVE ONE VACANCY for qualified physical therapist in our P. T. Department working with the rehabilitation of patients with industrial injuries. Previous orthopedic experience desirable, and congenial disposition to meet the standards of our present staff a prerequisite. Write J. B. Harris, Manager, The Rehabilitation Center, 28 North Franklin St., Chicago, Illinois.

WANTED: Physical therapist with experience, especially in corrective exercises for arthritis patients. Forty-hour week. Phone TEmpleton 8-0830, or write 580 Park Avenue, New York City. Doctor E. F. Hartung.

TOPEKA STATE HOSPITAL is inviting applications from qualified physical therapists. Male and female. Progressive and active program in all areas of psychiatry with national recognition. Variety of cases. Liberal salaries with periodic salary increases; holiday, vacation and sick leave benefits. Near city center. Contact Mr. Laurel V. Nelson, Coordinator, Adjunctive Therapies, Topeka State Hospital, Topeka, Kansas.

WANTED: Physical therapist, female, for 70 bed Crippled Children's Hospital. New modern equipment. 40-hour week, 3 weeks paid vacation, 2 weeks sick leave. Write giving qualifications, age, and date available. Texas Scottish Rite Hospital, Dallas, Tex.

WANTED: Physical therapist to join small staff in work prescribed by orthopedic surgeons in pleasant location separated from physician's offices yet with direct professional contacts assured. Salary open; vacation liberal; valuable experience offered. Write: The Physical Therapy Center of Sacramento, 2220 Jay Street, Sacramento, California.

WANTED: Two qualified physical therapists male or female. S. W. Polio Respiratory Center, Houston, Texas. Acute and convalescent polio care. Excellent salary and working conditions. Newest and latest equipment. 5½ working days, 14 days sick leave, 14 days vacation, 6 holidays. Contact Dr. William Spencer, Medical Director, S.W.P.R.C., Houston, Texas.

PHYSICAL THERAPIST NEEDED for work in cerebral palsy unit, Lincoln Public Schools, Lincoln, Nebraska. Service to begin around September 1, 1952. Please contact Steven N. Watkins, Superintendent of Schools.

PHYSICAL THERAPIST, qualified, wanted in 113-bed hospital located near Chicago, Illinois. Newly organized and active department. Excellent salary, vacation and sick leave policy. Apply Personnel Director, Highland Park Hospital, Highland Park, Illinois.

NEW CENTER opening in Phoenix, Arizona. Need physical therapist with training and experience in cerebral palsy. Salary open. Apply: Arizona Society for Crippled Children, 309 Heard Building, Phoenix, Arizona.

WANTED: Qualified female physical therapist in 160-bed general hospital, approved by A. M. A. Salary and details open. Write: Wendell H. Carlson, Administrator, Englewood Hospital, 6001 S. Green St., Chicago 21, Ill.

PERMANENT STAFF POSITION FOR PHYSICAL THERAPIST. Graduate of accredited school, good starting salary with regular increases; to work with neuromuscular disabilities (multiple sclerosis, polios, spastics, etc.) in the Kabat-Kaiser Institute, Santa Monica, California. Vacation with pay, sick leave, etc. Contact Nora Staael, Chief Physical Therapist, 1815 Ocean Front, Santa Monica, California.

WANTED: Qualified physical therapist to head well equipped department in 150-bed general hospital. Good salary and working conditions. Fine location. Vancouver Memorial Hospital, Vancouver, Washington.

WANTED: Physical therapist for hospital having department affiliated with New York Association for Crippled Children. Salary and details are open. Write H. G. Willis, Administrator, Alice Hyde Memorial Hospital, Malone, New York.

PHYSICAL THERAPIST for 250-bed general hospital. Work primarily with polio patients. Excellent salary with opportunity for advancement. Permanent. Baptist Hospital, Alexandria, Louisiana.

WANTED BY SEPTEMBER FIRST: Physical therapists, salary very good, at hospital day school located beautiful university town in Northwest. School serves handicapped children between ages of three to fourteen. Apply Howard F. Feast, Executive Director, Oregon Society for Crippled Children and Adults, Inc., 1135 S.W. Yamhill Street, Portland 5, Oregon.

RATES

The rate per insertion is 75c per line. Typewrite your advertisement carefully and count 50 characters and spaces per line.

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Institutions or physical therapists who do not wish their identity known may arrange for Blind Ad Code No. All such want-ads must include the following which will be counted as 2 lines:

Address replies to ..... care of **The Physical Therapy Review, 1790 Broadway, New York 19, N. Y.**

It is requested that descriptive adjectives be used instead of actual figures when referring to salary.

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It is understood and agreed that the publisher shall have the right to reject or change the wording of any advertisement which in the opinion of the Editorial Board shall not be in agreement with the ethical standing of this publication; the advertiser agreeing that the Editorial Committee shall be the sole and exclusive judge of the acceptance of any advertisement.

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This course is open to graduates of approved schools in physical therapy and occupational therapy. Such graduates must be members of the American Physical Therapy Association and/or the American Registry of Physical Therapy Technicians, and Occupational Therapy Association.

Tuition: None. For scholarship to cover transportation and maintenance, contact National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

Entrance Dates: First Monday in January, April, July and October.

Duration of Course: The course is divided into two parts:

Part I. Over-all care of convalescent polio with particular emphasis and special training in muscle testing and muscle reeducation.

Part II. Particular emphasis and special training in functional testing and functional retraining.

Each part lasts three months and only selected students who have completed Part I will be admitted to Part II. All students applying for Part I must be willing to remain through Part II if selected.

For Information Write:

Robert L. Bennett, M.D.
Georgia Warm Springs Foundation
Warm Springs, Georgia

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(limited at this time to qualified physicians, physical and occupational therapists)

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Physical therapists must be members of the American Physical Therapy Association, members of the American Registry of Physical Therapists, or qualified foreign physical therapists.

Courses start October 1st, January 1st, April 1st, and July 1st

Number of students accepted is limited. Certificate given upon successful completion of the course.

TUITION: $150

Applicants should communicate with:

Margaret Knott, Chief Physical Therapist
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